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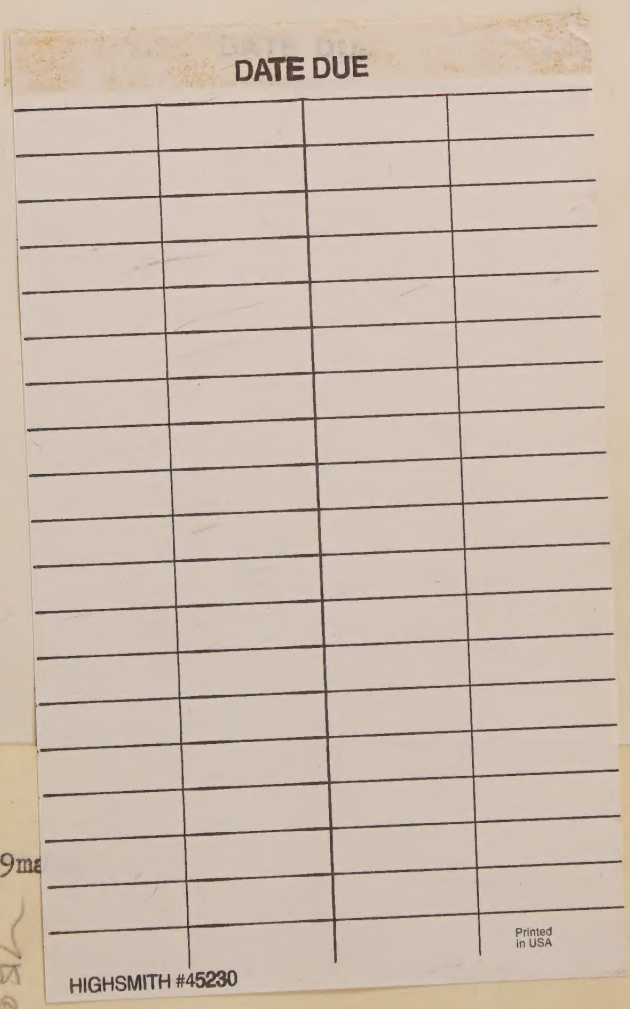

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MAN AND WOMAN

A Study of Secondary and Tertiary Sexual Characters

BY

HAVELOCK ELLIS

BOSTON AND NEW YORK
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The Riverside Press Cambridge
1929

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PREFACE

'MAN AND WOMAN' was published in its original shape in 1894. It was put forward as a study of the secondary sexual characters, intended to clear the ground, and so act as an introduction, for the seven volumes of 'Studies in the Psychology of Sex.' But, since men and women have a vast number of aspects not immediately associated with the sexual impulse, this book has been found to have a vigorous independent life of its own. It has passed through many more or less revised editions and been translated into many languages.

It has seemed to the publishers that the time has now come when the book might be remoulded and put into a more popular form. I have willingly accepted this suggestion and the book has now been largely rewritten and to a considerable extent brought up to date, though it is no longer possible, and indeed no longer seems desirable, to make the summary of work done in this field as complete as it was in its first shape. While much has thus been added, much has also been omitted, including especially many of the less important details and statistics, a great number of the footnote references to literature, a long appendix, and two whole chapters. It is considered that by these omissions the volume is maintained at a convenient size while at the same time but little is lost that would interest the reader who is not a specialist. Those who desire may still find the omitted matter in the previous sixth English edition as published by Messrs. A. and C. Black.

The development of biological investigation in the field of physiology during recent years has given greater precision to our view of sexual characters and placed them more clearly in relation with the organism generally. This orientation has affected the present book in its new

shape and has involved a redisposition of some of the chapters in a different perspective. But the general drift of the work remains completely unaffected by these new investigations, and the doctrine to be deduced from this study of secondary and tertiary sex characters — so far as the reader may trace any such doctrine — remains exactly the same: the entire equivalence of the sexes.

It is — I would say once more as I have often said before — equivalence and not equality in the sense of identity with which we are here concerned. There is no such thing as equality in the world of living things, even if there is in the realms of death. No two living things are equal, or indeed any single thing always equal to itself; it would be absurd to speak of the 'equality' of two whole sexes. We are concerned with masses of values which are unequal and not alike, so that it is constantly being found difficult to apply the same measuring-rod to man and woman. But the result is also constantly found that these unequal and unlike values are, in all their differences, of equivalent weight. The more comprehensive our investigation the more certainly we find that we cannot speak of inferiority or superiority, but that the sexes are perfectly poised in complete equivalence.

It has taken a long time to reach this conclusion. When the present book appeared in its earliest shape, it was a pioneering effort, not only in the sense of being the first attempt to view the totality of the phenomena involved, but in the sense that it tended to the conclusion that the sexes are equivalent in a way that excluded any notion of superiority or inferiority on one side or the other. That does not mean that it was a work of propaganda or of argument, for I set out on this path with an open mind and an entire willingness to accept the truth wherever it might lead. The general conclusion only became clear as I proceeded, and though it was a conclusion in harmony with the intuitions of many who had gone before, it was opposed not only to beliefs rooted in popular opinion and yet more

in social institutions, but it was opposed to traditions and prejudices by no means uncommon even in scientific quarters, where masculine superiority was sometimes almost a dogma. The rising tide of feminism in opinion and in social life was meanwhile carrying forward a totally different dogma: that of the 'equality' of the sexes in the sense of identity, with vigorous propaganda for the notion that sex is an unimportant accident in human nature, and that seemingly sexual differences were simply due for the most part to a difference in upbringing, and could easily be swept away, a view which would of course have to be applied to the whole animal world where sexual differences are just as marked as in Man.

Those who propagandised this now rather antiquated notion of the 'equality' of the sexes, in the sense of resemblance if not identity, were entirely justified in so far as they were protesting against that superstition of the inferiority of women which had proved so influential, and, as many of us think, so mischievous in its applications within the social sphere. But the banner of Equality under which they fought, while a wholesome and necessary assertion in the social and political realms, had no biological foundation. If it had, indeed, the feminist movement would have been deprived of its largest human claim. For that is not the abstract demand of a mere class for equality, but the affirmation that the two halves of the race are compensatory in their unlikeness, and that so long as each fails to carry its due weight in life humanity has not attained complete development.

It may be thought that in thus suggesting a conception towards which general opinion has been slowly moving for half a century, the present volume, even when remoulded and rewritten, no longer has any useful function to perform. I do not think so. Not only are there still a large number of persons who obstinately cling to the conceptions of the past, but, even among those who live in the present and look towards the future, there are inevitably doubts

and difficulties concerning the implications of sexual equivalence. Many problems remain and will continue to present themselves. It is helpful to be in possession of a few clues to the facts and considerations which throw light on these problems.

HAVELOCK ELLIS

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MAN AND WOMAN

CHAPTER I

INTRODUCTION

The primitive sexual division of labour — Man chiefly militant, woman chiefly industrial — Among savage races women not inferior to men — The industries of women gradually shared and then monopolised by men — The status of women in barbarism — The mediæval attitude towards women, and its causes — The physiological mystery of womanhood — The modern status of woman.

'A MAN hunts, spears fish, fights, and sits about,' said an Australian Kurnai once;[1] the rest is woman's work. This may be accepted as a fair statement of the sexual division of labour among very primitive peoples. It is a division of labour which is altogether independent of race and climate. Among the Eskimo, in their snow-houses on the opposite side of the globe, there is the same division of labour as among the Australians.[2] The tasks which demand a powerful development of muscle and bone, and the resulting capacity for intermittent spurts of energy, involving corresponding periods of rest, fall to the man; the care of the children and all the various industries which radiate from the hearth, and call for an expenditure of energy more continuous but at a lower tension, fall to the woman.

That is the general rule. In such matters the exceptions are very numerous. For example, among the Similkameen Indians of British Columbia, according to Mrs. Allison, who knew them well, formerly 'the women were nearly as good hunters as the men,' but being sensitive to the ridicule

[1] Fison and Howitt, *Kamilaroi and Kurnai* (1880), 206.

[2] See, for instance, H. H. Bancroft, *Native Races of the Pacific States*, I, 66.

of the white settlers, they have given up hunting.[1] Among the Yahgan of Tierra del Fuego fishing is left entirely to the women; [2] among the Tasmanians, perhaps the lowest human race ever known, the women alone dived for fish; and among the Tasmanians also it was the women who performed the remarkable feat of climbing the lofty smooth-trunked gum-trees after opossums.[3] In all parts of the world, in Australia and Africa, as well as among the ancient Celts, Teutons, and Slavs, women have fought at need, and sometimes even habitually.[4] But usually the perilous and fatiguing tasks of fighting and hunting, of such great moment in early culture, are left to the men. To these might for the most part be added dancing, which is more closely related to the others than is perhaps visible at first sight; it is at once a process of physical training and a mode of reaching the highly wrought mental condition most favourable for war; the more even activities of primitive women would be impaired rather than assisted by powerful stimulants.

The Indians of Guiana, as studied by a careful and sympathetic observer,[5] present us with a fairly average picture of the sexual division of labour among a race which has yet made little progress in barbarism. Men's work is to hunt and to cut down trees when the cassava is to be planted. When the men have felled the trees and cleared the ground, the women plant the cassava and undertake all the subsequent operations; agriculture is entirely in their hands. They are little if at all weaker than the men, and they work all day, while the men are often in their hammocks smoking. But there is no cruelty or op-

[1] Allison, *Journal, Anthropological Institute* (Feb., 1892), 307.

[2] P. Hyades et J. Deniker, *Mission Scientifique du Cap Horn*, VII. Paris, 1891.

[3] Backhouse, quoted by Ling Roth, *Tasmanians*, 16.

[4] This remained true even during the Great War of 1914–18, especially in Russia, where women have always had an intense love of soldiering. See for a popular account of this matter, Francis Gribble, *Women in War* (1916).

[5] Sir Everard im Thurn, *Among the Indians of Guiana* (1883).

pression exercised by the men towards the women. Pottery is entirely in the hands of the women; the men are specially skilful in basket-making; while both men and women spin and weave. If we turn to the heart of another continent, we find in East Central Africa a closely similar division of labour. 'The work is done chiefly by the women; this is universal; they hoe the fields, sow the seed, and reap the harvest. To them, too, falls all the labour of house-building, grinding corn, brewing beer, cooking, washing, and caring for almost all the material interests of the community. The men tend the cattle, hunt, go to war'; they also do all the tailoring and spend much time sitting in council over the conduct of affairs.[1]

While the men among all primitive peoples are fitted for work involving violent and brief muscular effort, the women are usually much better able than the men to undergo prolonged and more passive exertion, and they are the universal primitive carriers. Thus, among the Andombies on the Congo, according to Sir H. H. Johnston, the women, though working very hard as carriers, and as labourers in general, lead an entirely happy existence; they are often stronger than the men and more finely developed, some of them, he tells us, having really splendid figures. And Parke, speaking of the Manyuema of the Arruwimi in the same region, says that they are fine animals, and the women very handsome; 'they carry loads as heavy as those of the men, and do it quite as well.'[2] In North America, again, an Indian chief said to Hearne, 'Women were made

[1] James Macdonald, *Jour. Anth. Inst.* (Aug., 1892), 102. And for another picture of the sexual division of labour among a primitive people see Haddon on the 'Ethnography of the Western Tribes of Torres Straits,' in the same journal (Feb., 1890), 342. 'The men fished, fought, built houses, did a little gardening, made fish-lines, fish-hooks, spears, and other implements, constructed dance-masks, head-dresses, and all the paraphernalia for the various ceremonies and dances. They performed all the rites and dances, and in addition did a good deal of strutting up and down, loafing, and "yarning." The women cooked and prepared the food, did most of the gardening, collected shell-fish and speared fish on the reefs, made petticoats, baskets, and mats.'

[2] T. H. Parke, *Experiences in Equatorial Africa* (1891), 344.

for labour; one of them can carry, or haul, as much as two men can do.'[1] Schellong, who has carefully studied the Papuans in the former German protectorate of New Guinea from the anthropological point of view, considers that the women are more strongly built than the men.[2] In Central Australia, again, the men occasionally beat the women through jealousy, but on such occasions it is by no means rare for the woman, single-handed, to beat the man severely.[3] In Cuba, the women fought beside the men, and enjoyed great independence. Among some races of India, the Pueblos of North America, the Patagonians, the women are as large as the men. So among the Afghans, with whom the women in certain tribes enjoy a considerable amount of power. Even among the Arabs and Druses it has been noted that the women are nearly as large as the men. And among Russians the sexes are considered by Schaaffhausen to be more alike than among the English or French.

The militant side of primitive culture belongs to the men; the industrial belongs to women. The characteristic implement of women is not a weapon, but that knife called by the Eskimo the 'ulu' or woman's knife, which is used primitively for all manner of industrial purposes, and which still survives among European women as the kitchen chopping knife.[4] The man undergoes the fatigue of hunting, and when he has thrown the game at a woman's feet his work is done; it is her part to carry it and to cook it, as well as to make the vessels in which the food is placed. The skins and the refuse are hers to utilise, and all the industries connected with clothing are chiefly in her hands.[5]

[1] Hearne, quoted by Bancroft, *Native Races*, etc., I, 117. The chief added: 'They also pitch our tents, make and mend our clothing, keep us warm at night; and in fact there is no such thing as travelling any considerable distance in this country without their assistance.'

[2] Schellong, *Zeitschrift für Ethnologie* (1891), 173.

[3] *Jour. Anth. Inst.* (Aug., 1890), 61.

[4] See an elaborate study by Otis T. Mason of 'The Ulu,' *Report of the United States National Museum* (1890).

[5] There are, as ever, exceptions. In East Central Africa, for example, all

The domestication of animals is usually in women's hands. They are also usually the primitive architects; the hut in widely different parts of the world — among Kaffirs, Fuegians, Polynesians, Kamtschatdals — is built by women. Women are everywhere the primitive agriculturists, though the rougher and heavier work of making a clearing has usually fallen to men, and women hold their own in the fields even in the highly civilised Europe of to-day. Women have everywhere been the first potters; even in Europe, almost up to the present day, girls in Jutland were brought up to make pots.[1] Malinowski has given a detailed description of the technique of pot-making in the Amphlett Islands of Melanesian New Guinea. This art, which is highly esteemed in all the surrounding islands, is exclusively in the hands of the women, the part of the men simply being to procure the clay from a neighbouring island. These potters produce 'veritable masterpieces,' and their craft is far in advance of any similar achievement within the Melanesian region. 'It seems almost a miracle,' Malinowski adds, 'to see how, in a relatively short time, out of this after all brittle material, and with no implements whatever, a woman will shape a practically faultless hemisphere, often up to a metre in diameter'; the ornamentation is rudimentary.[2] Being thus the first potters, women prepared the way for decorative art, but they never went beyond its rudiments; ornamentation, apart from use, seems usually to be peculiar to men.[3] Women seem to have prepared the first intoxicating liquors; whatever we may

the sewing for their own and the women's garments is done by the men, and very well done; 'neater tailors than Africans it would be impossible to find anywhere,' says Macdonald. Sewing is here so emphatically recognised as men's work that a wife may obtain a divorce if she 'can show a neglected rend in her petticoat.' (Macdonald, 'East Central African Customs,' *Jour. Anth. Inst.* (Aug., 1892), 102–10.)

[1] See evidence quoted by Hein, *Zeitschrift für Ethnologie* (1890), V, 204.

[2] B. Malinowski, *Argonauts of the Western Pacific* (1922), 282–86. Man also gives an account of the primitive manufacture of pottery by women, 'Nicobar Pottery,' *Jour. Anth. Inst.* (Aug., 1893).

[3] Im Thurn states that in Guiana, even though the women make all the pottery, yet the ornamentation is as often the work of men as of women.

think of the obscure myth which represents the first woman as plucking the fermentable apple, in the north the ancient legends clearly represent woman as discovering ale.[1]

Women are sometimes the primitive doctors;[2] but this is by no means universal, probably because medicine-craft at an early period is not differentiated from priestcraft, which is always chiefly in the hands of men; their more stimulating life of alternate fasts and orgies amid wanderings far afield during the hazards of the chase or of war makes them more acquainted with morbid mental phenomena, and with the more 'supernatural' aspects of nature.

It is worth while to quote from the picturesque generalised account of women's industries among primitive races given by the late Otis T. Mason, Curator of the Department of Ethnology in the United States National Museum. He is writing more especially of the tribes of North America, races of whom our knowledge is extensive:[3] 'Let us follow the savage woman through her daily cares, in order that we may comprehend the significance of her part in the play. The slain deer lying before her cave, or brush-shelter or wigwam, shall be the point of departure in the inquiry. She strikes off a sharp flake of flint for a knife. By that act she becomes the first cutler, the real founder of Sheffield. With this knife she carefully removes the skin, little dreaming that she is thereby making herself the patron-saint of all subsequent butchers. She rolls up the hide, then dresses it with brains, smokes it, curries it, breaks it with implements of stone and bone, with much toil and sweat, until she makes her reputation as the first currier and tanner. With fingers weary and worn, with needle of bone, and thread of sinew, and scissors of flint, she cuts and makes the clothing for her lord and her family; no sign is over the door, but

[1] 'Magic Songs of the Finns,' *Folk-Lore* (March, 1892).

[2] Among the Kurds, for instance, Mrs. Bishop found that all the medical knowledge is in the hands of women, who are the hereditary hakims. (*Journeys in Persia and Kurdistan*, 1891.) And see Briffault, *The Mothers*, I, 485–88.

[3] *American Antiquarian* (Jan. 1889).

within dwells the first tailor and dressmaker. From leather especially prepared she cuts and makes moccasins for her husband. . . . Out of little scraps of fur and feathers, supplemented with bits of coloured shell or stone or seeds, she dresses dolls for her children, makes head-dresses and toggery for the coming dance, adorns the walls of her squalid dwelling, creating at a single pass a dozen modern industries — at once toy-maker, milliner, modiste, hatter, upholsterer, and wall-decker. . . . She was at first, and is now, the universal cook, preserving food from decomposition and doubling the longevity of man. Of the bones at last she fabricates her needles and charms. . . . From the grasses around her cabin she constructs the floor-mat, the mattress, the screen, the wallet, the sail. She is the mother of all spinners, weavers, upholsterers, sail-makers. To the field she goes with this basket or wallet strapped across her forehead. By the sweat of her face she earns her bread and becomes the first pack animal that ever bent under a burden in the world. . . . Home she comes with her load of acorns, roots, seeds, etc., and proceeds to crush them in a mortar or to roll them on a stone slab. Here she appears clearly as the primitive miller. Or, perchance, she lays her seeds in a flat tray, and by the help of the wind or a hot stone removes the chaff. Here begins her first lesson in threshing. . . . Perhaps with a stick, hardened and pointed in the fire, she digs the roots from the earth, or cleans or tears away troublesome weeds from useful plants, or digs a hole and drops the seeds of pumpkins, gourds, or maize therein. While we watch her working we are looking at the first gardener, farmer, and nurseryman. It may be that on some lonely plain or alluvial river-bank there is no cave to shelter her and her babes. How long will it take this aforetime basket-maker and leather-worker to devise a shelter of grass or skin, and become the architect primeval? . . . In the struggle for existence and exaltation which takes place among many occupations, as among individuals and species, militancy no longer demands all man's waking movements. The arts

devised by woman are in the ascendancy, and the man militant has glorified them by his coöperation. Her very ancient digging-stick is now a plough; her rude carrying strap over her aching forehead is now the railroad train; her woman's boat, the ocean steamer; her stone hand-mill, the costly roller-mill; her simple scraper for softening hides, the great tanneries and shoe-factories; her distaff and weft-stick, the power-loom; her clay and smooth pebble, the potter's wheel; her sharpened stick and bundle of hairs are all the apparatus of the plastic and pictorial arts. . . . In the early history of art, language, social life, and religion, women were the industrial, elaborative, conservative half of society. All the peaceful arts of to-day were once woman's peculiar province. Along the lines of industrialism she was pioneer, inventor, author, originator.'

As a more special detailed example of sexual division of labour, we may take the Central Eskimo as described by Dr. Boas:[1] 'The principal part of the man's work is to provide for his family by hunting, *i.e.*, for his wife and children and for his relatives who have no provider. He must drive the sledge in travelling, feed the dogs, build the house, and make and keep in order his hunting implements, the boat-cover and seal-floats excepted. The woman has to do the household work, the sewing, and the cooking. She must look after the lamps, make and mend the tent and boat-covers, prepare the skins, and bring up young dogs. It falls to her share to make the inner outfit of the hut, to smooth the platforms, line the snow-house, etc. On Davis Strait the men cut up all kinds of animals which they have caught; on Hudson Bay, however, the women cut up the seals. There the men prepare the deerskins, which is done by the women among the Eastern tribes. Everywhere the women have to do the rowing in the large boats while the man steers. Cripples who are unable to hunt do the same kind of work as women.'

When ethnographic knowledge was less advanced than

[1] *Annual Report Bureau of Ethnology* (1884–85), 579, 580.

at present, it was frequently stated that women are a source of weakness among savages, and that therefore their position is so degraded that they are almost in the position of slaves. Even at the present time, anthropological writers whose faith in the future leads them to be unjustly scornful of the past, have unintentionally misrepresented and distorted the facts of savage life. A more complete statement of the facts, and the deeper insight which we now possess regarding their interpretation, enable us to assert that while among many races women have been to a greater or less extent in subordination to their more powerful mates, on the whole the wider control which women have had over the means of production, as well as their diplomacy,[1] have given them influence and even authority. To these results have contributed, in many cases, no doubt, factors of a different order due to certain modes of marriage and filiation which have tended to give greater dignity to women.

At the same time it must always be remembered that matrilineal descent by no means involves gynecocracy; descent through the mother may well tend to high consideration for the mother, but seldom means mother-rule. We may observe this in certain villages of the Pyrenees, such as Barèges, where matrilineal descent persisted until the Revolution, the eldest daughter inheriting the property and choosing her own husband. 'The husbands of Barèges,' Abensour remarks, 'while merely the head valets in their own houses and not able to dispose of even the smallest part of the family property, yet possess the right to beat their wives with the hand, the fist, and the stick.' [2]

[1] Of the women of many races it may be said, as the Reverend C. Harrison says of the Haidas of the Queen Charlotte Islands, 'The women are great diplomats, and generally contrive to have their own way, and it is a great mistake to imagine that they are treated as slaves' (*Jour. Anth. Inst.*, May, 1892, p. 472). Among the Australian Dieyerie, Curr stated that the women act as ambassadors to arrange treaties, and invariably succeed in their missions. Among the Kiwai Papuans (*Jour. Anth. Inst.*, 1916, p. 3327), though women are killed in war like men, it is through the women that peace is usually made.

[2] Léon Abensour, *Histoire Générale du Feminisme* (1921), 13.

M'Lennan, Lubbock, and Letourneau were probably the most prominent anthropologists who argued, apparently from their knowledge of civilised women, that among savages women are a 'source of weakness,' and in consequence liable to oppression. But, as has often been pointed out by those who possess more than a second-hand acquaintance with savage life, although this is sometimes the case, it is not seldom the very reverse of the truth. Thus Fison and Howitt, who discuss this point, remark, in regard to Australian women: 'In times of peace, as a general rule, they are the hardest workers and the most useful members of the community.' In times of war, again, 'they are perfectly capable of taking care of themselves at all times; and, so far from being an encumbrance on the warrior, they will fight, if need be, as bravely as the men, and with even greater ferocity.'[1] Buckley, who lived for thirty-two years among Australian savages, mentions that when those he lived with were attacked by a numerous hostile party, 'they raised a war-cry; on hearing this, the women threw off their rugs and, each armed with a short club, flew to the assistance of their husbands and brothers.'[2] 'They who are accustomed to the ways of civilised women only,' remarks Mr. Fison, 'can hardly believe what savage women are capable of, even when they may well be supposed to be at their weakest. For instance, an Australian tribe on the march scarcely take the trouble to halt for so slight a performance as a childbirth. The newly born infant is wrapped in skins, the march is resumed, and the mother trudges on with the rest. Moreover, as is well known, among many tribes elsewhere it is the father who is put to bed, while the mother goes about her work as if nothing had happened.'

Man has been the most highly favoured and successful of all species, and, as Mason well remarks, 'If one half of this species, the maternal half, in addition to many natural

[1] Fison and Howitt, *Kamilaroi and Kurnai*, 133–47, 358.
[2] *Life and Adventures of William Buckley*, 43.

weaknesses, had been from the first the victim of malicious imposition and persecution at the hands of the other and stronger half, humanity would not have survived.' [1] Horatio Hale, another well-known American anthropologist, in a paper read at the annual meeting of the Royal Society of Canada in 1891, likewise observes: 'The common opinion that women among savage tribes in general are treated with harshness, and are regarded as slaves, or at least as inferiors, is, like many common opinions, based on error, originating in too large and indiscriminate deduction from narrow premises. A wider experience shows that this depressed condition of women really exists, but only in certain regions and under special circumstances.'

Rasmussen, who is intimately acquainted with the Eskimo, writes of their wives: [2] 'Living amongst them, you see for yourself that cruel blows are not unfrequent. But certainly no one would be more astonished than she herself, if you came to the Eskimo woman and pitied her; for her body is strong and healthy, her heart light, and her mind well-balanced; and so life seems to her worth living, and admirably and sensibly arranged. She herself has no consciousness whatever of being man's drudge. . . . We forget that even civilised man, by a poisoned word, can often strike harder and more brutally than the Eskimo with his fist.' Of the Bantu tribes of East Africa, the Hon. C. Dundas writes: [3] 'The native woman is neither drone nor drudge; she is an active partner. Between the two sexes there has been established a relation of mutual support, demanding reliance of the one upon the other. By courage and strength men supported and protected their homes, and by diligence and activity women created something worthy of protection. Else by what means were men roused to stake their lives for the defence of these

[1] Mason, *American Antiquarian*, Jan., 1889.
[2] *People of the Polar North* (1908), 62 *et seq.*
[3] *Jour. Anth. Inst.* (XLV, 1915), 304.

homes? . . . Those who have to deal with native tribes can make no greater mistake than to regard the women as a negligible quantity in political and domestic affairs.'

In a primitive and unstable state of existence, men are chiefly occupied in the absorbing duties of war and the chase. As the position of a tribe and its means of subsistence become more assured, the men are enabled to lay down their weapons and to take up women's implements, and specialise women's industries. As Mason pointed out, the primitive woman handed her ulu over to the saddler, teaching him, apparently, how to work in leather; the saddler of ancient Egypt, as depicted on monuments, used the ulu, and the saddler of to-day still uses it. It may thus have happened that, as we sometimes find still among races which have passed from savagery into the earlier stages of barbarism, and among whom war happens to occupy a small place, various industries are fairly divided between the sexes. Thus, among the Melanesians, a horticultural people who show great skill in such work, 'the respective share of men and women in garden work is settled by local custom.' [1] But an equality of this complete kind rarely seems to have been the rule. Women invented and exercised in common multifarious household occupations and industries. They were unable to specialise their work, and in consequence they could not develop it highly. Men, liberated more or less from the tasks of hunting and fighting, gradually took up the occupations of women, specialised them and developed them in an extraordinary degree. Why the division of labour should be a masculine and not a feminine characteristic, whether it is the result of physical and mental organisation, or merely due to social causes, is not quite obvious; probably it is due to both sets of causes. Maternity favours an undifferentiated condition of the various avocations that are grouped around it; it is possible that habits of war produced a sense of the advantages of specialised and subordinated work. In any case the fact

[1] Codrington, *The Melanesians* (1891), 304.

itself is undoubted, and it has had immense results on civilisation.

To speak with assurance regarding the respective status of the sexes in savagery, the early stages of barbarism, and the ancient and sometimes highly developed cultures, is not easy. There are not many races in an uncontaminated stage of early barbarism; the records are inadequate; it is rare to find an observer who is sufficiently intelligent and sympathetic to be able to understand the conditions of such races; and it is difficult to estimate the disturbing influence of various conditions which deviate the circumstances of such races from the typical order. It is worth noting, however, that while an ultimate masculine predominance is the more usual rule, a high position of women is far from uncommon even among barbaric peoples in a frequent state of war, and seems to have been more marked in ancient than in modern cultures. In the Babylonian and Assyrian colony of Burus in Asia Minor more than four thousand years ago, a military as well as commercial centre, Sayce states that women seem to have had equal rights with men and held similar official authority; there was also a Woman's University, with faculties of Literature and Arts, though the Principal was a man. The high position of women in modern Burma has often been described. 'There is no woman,' Max and Bertha Ferrars state, 'so well able to shift for herself as the woman of Burma. Nowhere else is the wife more prized; nowhere is woman better able to make terms with man. Although under the Hindu Code of Manu, which the Burmese nominally follow, the status of women is only the Indian one, no disability of a practical kind exists for her.' Sir George Scott testifies in the same sense. Not only is divorce by mutual consent, but 'the slippering of husbands is much more frequent than wife-beating,' and 'few people are more fluent and merciless than Burmese women.' They seem, indeed, to possess the active virtues generally; the men are apt to be lazy and the women are 'infinitely

smarter at business.' Scott considers that in no other Eastern country, and in few, if any, Western countries, do women possess so much freedom and independence; and for good sense and good taste he would place them above Japanese women.[1]

The status of Hindu women in India is referred to as inferior to that of Burmese women. Nominally and superficially, even in large degree in reality, it seems correct so to regard it; and that inferiority is heightened by the extreme illiteracy in which Hindu women are still left. Yet the Hindus cherish an extremely high ideal of womanhood, and great influence is exerted by women, though it is exerted domestically and by women who are expected to cultivate a kind of worship of their husbands.[2] Among the Mohammedans it is said, however, by an English authority (Sir Lepel Griffin) that the married woman's position is to-day, socially and legally, more secure, and more protected against arbitrary violence to either person or property, than that of an English woman.

In China women have a greater freedom and influence than in Japan,[3] though they are not so extravagantly idealised as in India, probably because the erotic side of life, while fully accepted by the practical Chinese mind, is not regarded as of supreme importance. It is much less

[1] M. and B. Ferrars, *Burma* (1901); Sir George Scott, 'The Position of Women in Burma,' *Sociological Review*, April, 1913.

[2] A. W. Frazer, *Indian Thought Past and Present* (1915), chap. xi.

[3] Japan is now becoming Westernised in many respects, including those which concern women. But there is a difference of opinion as to the alleged inferiority of woman's position in the real Japan. Thus Ernest Pickering writes (*New Statesman*, 14 April, 1928) that 'increasing experience of Japanese life encourages the conviction that a Japanese woman is, in essentials, no more an inferior being than her Western sister, unless we consider the acceptance of prostitution as an exception. Not only does she usually manage all the family affairs, undertaking the responsibility in matters in which Western women are often mere children, dependent on the superior wisdom of the male; but her charming manners and gentle readiness of service give her a peculiar power of her own, with children, husband, and strangers alike. An American woman missionary of my acquaintance, who has had over twenty years' experience amongst Japanese women, roundly declares that what is said about the Japanese woman's inferior position is mostly nonsense.'

important than the ancestral relationship. In carrying on ancestor worship, it is the son who takes the chief part, and the woman who becomes his wife leaves her own family to accept his ancestral duties. But while his position is thus above hers, and the birth of a son is the cause of more rejoicing than that of a daughter, women in China are not held to represent a principle of inferiority, and in practice may, and sometimes do, become the equals of their husbands and share in their life-work.[1] This is one of the characteristics which have led a sensitive English observer to remark that the fundamental attitude of the Chinese towards life is that of the most modern West, far more than that of India.[2] So true is this that in the revolutionary movement going on in China, nationalistic as the ardour may be which inspires it, Western ideas are being adopted with a rapidity and thoroughness which hardly commends itself even to the Western mind. Mr. Bertrand Russell, who lectured in China, has told of the eager receptivity of his young Chinese auditors to the latest ideas of Europe, and a correspondent of the London 'Times' in Changsha, the capital of Hunan in Southern China, has described how in that city 'several thousand women and children marched round the streets with banners calling on women all over the world to be free,' and considers that 'in China to-day moral and family life is undergoing a revolution that may have more far-reaching consequences than the political changes.' The elaborate rites and customs of marriage are being swept away. Men and women meet and marry without the old intermediary customs, and a marriage ceremony is described which consisted mainly of speeches concluding with a revolutionary song to the tune of the old French nursery rhyme, 'Frère Jacques, dormez-vous?' The young women are determined to take an equal place

[1] See, e.g., Dr. Richard Wilhelm, 'The Chinese Conception of Marriage,' in Count Hermann Keyserling's *Book of Marriage* (1926).

[2] G. Lowes Dickinson, *The Civilisations of India, China and Japan* (1914), 47. 'In many respects,' he says of the Chinese, 'the most civilised people the world has seen.'

with men in the service of the country, though while the study of the ancient Chinese classics is neglected they have not yet been adequately replaced.[1]

When we return to Europe we find that, for instance, the Anglo-Saxons of England, fifteen hundred years ago, were rough and warlike, but in the arts and affairs of peace women took a large and important place. This was mainly confined by the disturbed condition of the country to the convents, but there the activities of women were prominent and varied, and we catch attractive glimpses of them in their letters.[2]

But the English successors of the Anglo-Saxon women degenerated. Valuable work of any kind was seldom any longer done in the convents.[3] Nor is there any outstanding literary figure like Hrotswitha of Gandersheim on the Continent. Julian of Norwich, the famous mystical writer, was an anchoress, not a nun. Women were beginning to become more active in the world outside the convents.

When we thus turn to races in a highly developed state of barbarism, such as we find in mediæval Europe, the materials on which to found a judgment are so ample that it is impossible to generalise in a broad and unmodified manner. We have before us chronicles, romances, *fabliaux*, *contes*, *acta sanctorum*, codes, customaries, proverbs — altogether a vast amount of original documents — all throwing more or less unintentional light on the respective parts played by men and women in the developed barbarism of mediæval Europe. One who has only been able to dip here and there into this fascinating mass of literature cannot pretend to speak of any definite and assured result.

[1] *The Times*, 23 May, 1927.

[2] Montalembert, *Monks of the West*, IV, Book 15; G. F. Browne, *The Importance of Women in Anglo-Saxon Times* (1919).

[3] The conditions have been described in detail by Miss Eileen Power in her fully documented and highly interesting work, *Mediæval English Nunneries* (1922), 287 *et seq.*, and a wider survey of the same subject is presented in Lina Eckenstein's *Woman Under Monasticism* (1894).

But there are certain points that strike one again and again. The militant element ruled throughout mediæval Europe, and that meant the predominance of men. Thus if we examine the great French epic cycle as Krabbes has done,[1] we see such a state of society depicted the more veraciously because incidentally and unintentionally. The men were above all fighters, and even the women delighted in fighting; women had utter contempt for the man who was a coward in war, and at times took a subordinate part in war themselves, guarding prisoners for example. The entire absorption of the men in fighting had a marked effect on the passion of love. The women in these epic poems are usually the wooers; the men are generally indifferent, rarely actively in love with the women to whom they yield; they merely respond, and often not so warmly as the women desire; the women openly embrace the men who attract them, and only once do we read of a woman who was ashamed to kiss in public, while men are represented as decidedly less sensual than women.[2] But notwithstanding this freedom of initiative, when the woman becomes a wife she is entirely in the power of her husband, who may address her in terms of the greatest contempt.

The beginnings of industrialism were not destructive of the militant spirit and its predominance. Even in republican industrial towns it was frequently necessary that the workers should also be fighters. In early barbarous societies we see men gradually taking up and specialising the industries originated by women; in the developed barbarism of Europe only a few simple household industries were on the whole left to women. Even in the monasteries, where men and women lived under similar conditions, it cannot be said that the achievements of women in any field rivalled those of men. For women there was

[1] Theodor Krabbes, *Die Frau im altfranzoesischen Karlsepos* (1884).

[2] In quite different stages of culture women have also been the wooers in love. That this was so in ancient Egypt is indicated by W. Max Müller's *Die Liebespoesie der Aegypter* (1899), though Müller himself hardly admits this.

the home and, it must be added, the brothel; while a vast stream of women for whom there was no other outlet — a stream including the insane and the hysterical, but certainly many who were neither — fell under suspicion of sorcery and perished as witches. By this divergence of the paths of women from the paths of men, the attitude of men towards women and of women towards men was wrought up to a pitch of emotional intensity before unknown. When we look into this wonderful mediæval literature, we seldom find men and women in the attitude of comrades and fellow-workers, as we nearly everywhere find them in earlier stages of society. We find, instead, men, influenced to some extent doubtless by traditions of Christian asceticism, as well as by the actual facts of mediæval life, regarding women as the symbols of the sensual element in life, as the force that retards progress and growth, and at the same time — a more pagan element perhaps coming in together with a tinge of mysticism — we find that women are regarded as the inspirers of men, the spiritual and refining elements of life. Partly, it seemed, women were good to play with, partly good to worship.[1] A large part of the real work of the world was women's to do — although under military as well as monastic conditions men and women were relatively independent of each other — but their work seems to have been regarded as little worth mention; work did not fit in with the mediæval theory of women.

Subjection was, indeed, the fundamental status of the mediæval woman. She was primarily a wife, and, as such, in a patriarchal society, she was subject to her husband.

[1] The comic literature of mediæval times — farces, *fabliaux*, *contes*, etc. — is impregnated with the feeling of suspicion and horror as regards women. The opposite and complementary tendency to glorify women may be found not only in the love-poetry of the epoch, but also in a large but now forgotten group of prose literature. Thomas, in his *Essai sur le caractère, les mœurs, et l'esprit des Femmes*, gave an account of some portions of this literature. A contemporary picture of the fascination and duplicity of the mediæval woman, drawn with a psychologic subtlety altogether modern, is embodied in *Petit Jehan de Saintré*.

That was the essential fact, whatever opposing extremes of idealisation or of degradation might be sometimes thrust upon her. The voice of these two extremes is constantly heard. Even Chivalry spoke ambiguously, and the Church had two voices: woman was by turns the special instrument of the Devil and the special instrument of God to indicate the road of salvation. Indeed, the Church promulgated these opposing views simultaneously. 'Janus-faced,' remarks Miss Eileen Power, 'it looked at woman out of every pulpit, every law book, every treatise, and she never knew which face was turned upon her. Was she for the moment Eve, the wife of Adam, or was she Mary, the mother of Christ?' [1]

An important origin of the element of mystery which women have aroused in men and even in themselves lies in the periodic menstrual function. This function, unlike any normal physiological function in men, has been an everlasting source of marvel and of apprehension among all primitive races. They have been singularly unanimous on this point, and even seem to show a certain amount of unanimity in their explanations. As has been shown by Ploss and Max Bartels, the snake (or occasionally some allied reptile, such as the crocodile or lizard) has been connected with this function or with its mythical origin; in New Guinea, in Guiana, in Portugal, in Germany, traces may be found of this connection, often seeming to indicate that a snake, whether from love or a hostile purpose, had bitten the sexual organs of woman and so caused the phenomenon. I would add that in the Hebrew story of the Garden of Eden we trace a similar primitive connection between woman and the snake.[2] Everywhere during the continuance of the flow, the woman is regarded as more or less unclean. When this attitude is more clearly

[1] Eileen Power, 'Medieval Ideas about Women,' *Cambridge Magazine*, 2 Nov. and 9 Nov., 1918; Lecky's *History of European Morals* may also be consulted, and the various learned works of Dr. Coulton.

[2] For further details see Havelock Ellis, *Studies in the Psychology of Sex*, I, Appendix A, 'The Influence of Menstruation on the Position of Women.'

marked, she must refrain from all household duties, especially from the preparation of food, and to approach her is often an offence. For a time she is in exactly the same position as the mediæval leper. She must wear a special garment (as in some parts of India), or call aloud to warn all who approach her that she is unclean (as in Surinam), or dwell apart either in a hut alone or in a house reserved as a common dwelling for women in the same condition (as in the Caucasus, Japan, the Caroline Islands, among the Hottentots, the North American Indians, and many other races). We are familiar through the Old Testament with the elaborate code of barbarous ritual which grew up among the Jews, while, according to some of the ancient Hindu sacred writings, the menstruating woman was taught to regard herself as a pariah; by an early Council of the Western Church a woman was forbidden to enter a church during her period; and among the Christians of modern Greece she is not allowed to kiss the images in church, or to partake of the communion.[1] As we approach the higher levels of barbarism, the custom of making a marked social difference in the treatment of women at this period gradually disappears, but the feeling itself by no means disappears. Instead of being regarded as a being who at periodic intervals becomes the victim of a spell of impurity, the conception of impurity becomes amalgamated with the conception of woman. It was thus that a large number of the early Christian writers regarded woman; she is, as Tertullian puts it, the Gate of Hell, *janua diaboli*; and this is the attitude which still persisted in mediæval days, though it should be added that ascetics impartially extended the idea of impurity to men also. At the same time the belief in the periodically recurring specific impurity of women has by no means died out even in civilisation to-day. Among a large section of the women of the middle and lower classes, it is firmly believed that

[1] The ethnography of this subject is dealt with in detail by Ploss, Bartels, and Reitzenstein, *Das Weib*,

the touch of a menstruating woman will contaminate food; in the course of a correspondence on this subject in the 'British Medical Journal' (1878), medical men were found to state from personal observation that they had no doubt whatever on this point. Thus one doctor, who expressed surprise that any doubt could be thrown on the point, wrote, after quoting cases of spoiled hams, etc., presumed to be due to this cause, which had come under his own personal observation: 'For two thousand years the Italians have had this idea of menstruating women. We English hold to it, the Americans have it, also the Australians. Now I should like to know the country where the evidence of any such observation is unknown.' Women of every class preserve this belief, and still regard the periodic function — although it is frequently a factor of the first importance in their personal and social life — as almost too shameful to be alluded to.

We may thus still find widely contradictory views put forward as to the position of women during the mediæval European period. It is sometimes placed very high and sometimes very low. If we take a sufficiently comprehensive survey, we shall find that both these views were based on fact, and that the position of women in life during those ages was somewhat contradictory. We also have to recognise differences of status in different countries and at different periods. Thus, as has been noted, in Anglo-Saxon England women often occupied a conspicuous position; mention of women holding land (even a married woman and in her own right) is not infrequent. But this characteristic of late Anglo-Saxon law quickly disappeared under the influence of feudal jurisprudence which favoured men. Nor was woman-right a primordial trait of Teutonic society; legal custom among the Saxons, as among other allied tribes, was in favour of male succession to land, woman-right being due, in Vinogradov's opinion, to special rules of privilege.[1] In France, during the feudal

[1] P. Vinogradov, *English Society in the Eleventh Century* (1908), 251–53.

period of the twelfth and thirteenth centuries, Luchaire, a great authority, writes that 'the amorous theories of the troubadours of the South and some trouvères of Flanders and Champagne must not delude us; the sentiments they express are simply those of an *élite*, a very small minority of knights and barons in advance of their age.' Fathers and husbands treated women as essentially inferior, and most men so regarded them. The heiress was never consulted concerning her own marriage, nor was her husband. Fathers and suzerains were autocrats.[1]

Masculine supremacy became embodied in law. The relation of a husband to his wife, and also to his servants, resembled that of king to subject. To murder him was more than murder; it was petty (*petit*) treason, and the penalty laid down in England (as by statute of Edward III) was burning at the stake. Women were burnt for this offence (as well as for coining, which was treason against the King) down to 1789, the law being repealed in the following year. But during that century, with the growth of humanitarian feeling, it had become the merciful practice to strangle the woman before burning her.[2] Among the common people the conception of the kingship of the husband was sometimes carried to the further point of regarding her as a slave, a possession, who might be sold. This practice was recognised, and it is frequently noted as having taken place, down at least to the end of the eighteenth century. In Warwickshire, for instance, a wife could be brought to market with a rope around her neck, like a cow, and be sold for a sum varying from one to three half-crowns. Such a sale 'seems to have been considered quite above reproach.'[3]

[1] Luchaire, *La Société Française sous Philippe-Auguste* (1909), 380.

[2] *Notes and Queries* (12 Aug., 1922), 132.

[3] *Notes and Queries*, 16 July, 1921. We are told (*ibid.*, 16 Oct., 1926) how at Ongar in Essex a poor but honest working-man, with a wife not remarkable for virtue, brought her to market with a halter round her neck and sold her to a smith for two shillings, the sum being at once paid, together with the usual market tolls. The most usual price was five shillings. But in 1823 (*The Times*, 20 May, 1823) a man at Halifax in Yorkshire brought his wife

But we have to remember that, though wives were theoretically, and often actually, in subjection to their husbands, in the ordinary work of the world that fact meant little. Miss Eileen Power, who has studied the position of women in mediæval times, considers that while mediæval ideas about women were as contradictory as generalisations about sex must inevitably be, there was 'a considerable practical equality. The records show women living with their men in a state of rough-and-ready equality, much relied upon, not only in the home but in a wider sphere. When the bourgeois goes away on business, when the lord goes to the wars, it is his wife who runs the shop or the manor in his absence and stands a siege when she has to; when he dies it is his wife who is named as executrix of his will.' [1] Powell puts it that 'a wife was to be regarded as a natural and somewhat uninteresting, though none the less valuable, adjunct to everyday life.[2]

Even when women seemed to be losing in one direction, they were gaining in another. There is reason to believe that women were in many respects better off in Elizabethan times than in the following century, freely working in crafts with their husbands, while in the seventeenth century they were excluded from trades and became economically more dependent, a change attributed to increased capitalisation of industry (though this has been denied), to civil war, pestilences, the dissolution of the monasteries, etc.[3] Yet in the same seventeenth century a higher conception of women and more considerate regard for women were spreading. It was becoming possible to look down on a man who took the subjection of women too seriously.

to market and commended her so highly that he obtained twenty shillings. Sometimes, however, if considered a 'bad lot,' no purchaser could be found, and public feeling was becoming hostile to such sales; at Cheltenham in 1825 (*The Times*, 9 March) the enraged populace took the rope from the wife's neck, and tied the husband to a signpost and pelted him with rotten eggs. And see also Briffault, *The Mothers*, II, 222.

[1] Eileen Power, 'Mediæval Misogyny,' *New Statesman*, 12 March, 1927.

[2] C. L. Powell, *English Domestic Relations, 1487–1653*.

[3] A. Clark, *Working Life of Women in the Seventeenth Century* (1920).

In the middle of the seventeenth century, Braithwait, the author of an esteemed manual of that day, could write: 'I have observed a strange kind of imperious and domineering sovreignty in some Husbands; who hold it a great posture of state to insult over their wives.' [1] By the beginning of the eighteenth century the cause of women had triumphed on the stage, and Congreve, the chief of English comic dramatists, became their champion.

But the general effect on women of the militant mediæval organisation and its correlated conditions might still be felt. Openly they tried to live up to the angelic ideals of men; secretly they played with men; unostentatiously they worked, either honestly in their homes, or by intrigue in public affairs. In the great centres of European life, during mediæval and later times, these conflicting ideals produced very complex and attractive feminine personalities, often much more delightful and even more wholesome than the influences which moulded them would lead us to expect, but usually more or less profoundly tinged by the unavoidable duplicity of conflicting ideals.

Many of these sexual characteristics have doubtless persisted to modern times, but the conditions which gave rise to them have in large measure changed. The eighteenth century in Europe, more especially in England and France, was marked by a widespread resolve to reason clearly concerning the nature and causes of things, so far as possible casting off prejudice, and it could not fail to touch the questions that concerned the status of women; such problems were no longer left to work themselves out in unobserved silence. At the same time an economic revolution was taking place which tended to withdraw women from their homes and men from their previously more independent and intermittent labour. A new industrial *régime* was emerging by which work became organised

[1] R. Braithwait, *The English Gentleman and the English Gentlewoman* (1641). Much information concerning English women is brought together in the work of M. Phillips and W. S. Tomkinson, *English Women in Life and Letters* (1927), which is admirably illustrated.

in large centres, and the introduction of machinery enabled men and women to work side by side at the same or closely allied occupations. This is still going on to-day. It is also being recognised as reasonable that both sexes should study side by side at the school and the college, and where not side by side, still in closely similar fashion, while the recreations of each sex are to some extent becoming common to both. Such conditions have tended to remove artificial sexual differences, and have largely obliterated the coarser signs of superiority which may before have been possessed by one sex over another.[1] The process of transition is still in progress. It began in the lower and more mechanical fields of labour; it is proceeding to the higher and more specialised forms. Women have entered, everywhere, the various learned professions, and are acquiring the same rights of citizenship as men.

As such social changes tend more and more to abolish artificial sexual differences, thus acting inversely to the tendency observed in passing from the lower to the higher races, we are brought face to face with the consideration of those differences which are not artificial, and which no equalisation of social conditions can entirely remove, the natural characters and predispositions which will always

[1] These conditions, it may not be unnecessary to add, do not affect the essential traits of either masculine or feminine nature, though they are sometimes supposed to do so. As one of the older generation well writes (*The Times*, 2 Feb., 1927): 'Except in outward appearance due to fashion, the Victorian girls and women were very like their Georgian successors. The view that they were timid, fainted at the sight of a mouse, were ill-educated and unable to talk intelligently, the mere slaves or chattels of their husbands, is all moonshine. My mother, who was born just a century ago, was quite capable of holding her own in any society and on any subject of general interest. She rode to hounds as pluckily as any modern woman, could drive a pair of horses, write the most amusing letters, and governed her family (not excluding her husband) and household in a way that is seldom seen now. I cannot but think that the current erroneous conception of the Victorian woman is largely due to Thackeray and Dickens, neither of whom could portray the average gentlewoman of the period, but invariably made her either a vicious and dishonest devil or a weeping, shrinking, and puling imbecile. The generality were neither one nor the other. They were just as attractive and just as sweet and interesting as the girls of to-day, and merely differed from them in the greater freedom and more intimate association with men which time has made possible.' I have no doubt this view is sound.

inevitably influence the sexual allotment of human activities. So long as women are unlike in the primary sexual characters and in reproductive function they can never be absolutely alike even in the highest psychic processes. What is the nature, so far as we can venture to tell it to-day, of these fundamental secondary sexual characters?

CHAPTER II

HOW TO APPROACH THE PROBLEM

The primary sexual characters — When sex is determined — The hormones — The definition of secondary sexual characters — Standards of comparison — The infantile and the senile — The human characteristics of infant apes — The position of the lower human races — Fallacies due to defective data and to bias — Incompleteness of our knowledge.

Male and female have their ultimate explanation in the respective constitutions of the two germs, or gonads as they are termed, from which development proceeds. The distinction, it is now held, exists at the outset, and cannot, as was once believed, be affected during early fœtal life. The male gonad is constituted by the presence of two chromosomes, *X* and *Y*, the latter, however, seeming inactive in inheritance, and the female gonad is constituted by two *X* chromosomes. If a *Y*-bearing sperm fertilises the ovum, the resultant will thus be *XY* and male; if an *X*-bearing sperm fertilises the ovum, the resultant will be *XX* and female. The difference between male and female is the difference between *XY* and *XX*.

It is on these primary gonads, as situated respectively in the testicles of the male and the ovaries of the female, that all the innate qualities of maleness and femaleness mainly depend. Removal of the gonads, or castration, in either sex affects, more or less, the whole subsequent development or maintenance of the individual, not merely in those respects which we commonly regard as sexual, but in other morphological, physiological, and psychical sex-dimorphic aspects, such as the length of the bones, the regional distribution of the hair, and the pitch of the voice. The extent of the effects of such castration (or gonadectomy) depends on the period in the life of the individual at which it is effected. If it takes place before puberty, the results are pronounced; not only do the genital organs fail to develop fully, but there are a number of structural

modifications in development and the mental condition is apathetic. Gonadectomy after puberty produces an effect in inverse ratio to the age of the individual at the time of the operation, becoming unimportant after full development has been attained.

The removal of the specific source of sex by gonadectomy, in either male or female, does not lead to the assumption of the characters of the other sex. It has sometimes been supposed to do so, but that supposition seems due to a misinterpretation of the conditions observed. They really represent an agonadic state which is intersexual only in the sense of being deficient, not in the sense of being an approximation to the other sex. Expressed in other words, it may be stated that the disappearance or atrophy of homologous sex-characters does not lead to the appearance of heterologous sex-characters. Some authorities, however, believe that the female sex-characters are nearer to this intersexual or agonadic form than are the male sex-characters.[1] Gonadectomy, it may be added, does not result in a diseased condition. It is the special function of the gonads to develop and maintain sexuality, and, directly or indirectly, the characters with which we shall in this book be concerned, but the failure of sexuality to develop is not disease.

While the gonads are the central sources of the sexuality of the organism, and the complete male or female is impossible in the absence of the internal secretions already being sent out into the blood from the testicles in infancy, and after puberty from the ovaries, other internal secretions also play a part in sexuality.[2] Such hormones, as these internal messagers are termed, proceed from various organs, from the thyroid and the parathyroid, from the

[1] This would harmonise with the view (as, for instance, stated in an interesting paper on sexual dimorphism, by Kramer, *Zt. f. Sexualwissenschaft*, April, 1920) that the female more nearly represents the condition before the origin of sexual division and is therefore 'the crown of creation,' the male being differentiated later.

[2] For a full and clear account of these sex hormones, see Lipschütz, 'The Internal Secretions of the Sex Glands' (1924).

pituitary, from the adrenals, and from other organs. These organs (unlike the gonads) have special functions of their own to perform which when disturbed may lead to disease, but they also have an influence in fortifying, restraining, or modifying the main driving sexual force of the male and female gonads, and only when associated with the harmony and balance of their play can the individual sexuality be achieved, or maintained on a normal plane. So that while it was said of old that 'a woman is a woman by virtue of her womb,' which dictum gave way later to the saying, 'a woman is a woman by virtue of her ovaries,' the dictum to-day is: 'a woman is a woman by virtue of all her internal secretions.' The way is thus opened for many minor sexual deviations, disharmonies, and intersexual stages, the mechanism of which is not yet altogether clear.[1]

In dealing with Man, however, for the present purpose, we are not further concerned with the primary mechanism and the complicated problems of sex heredity, concerning which a Dutch investigator (J. C. H. de Meijere) declared not many years ago that it is a labyrinth which will take a century to explore. We may pass on at once to our main concern: the investigation, in their normal form, of those secondary gonadic characters which most prominently and distinctively mark sexual dimorphism in Man. We wish to ascertain, as far as we can, the reality and the extent of their differentiation, and to discuss their significance.

The term 'secondary sexual character' was first used by Hunter. He applied it to such a structure as, for instance, the comb of the cock, but, so far as I have been able to find, he does not anywhere define precisely what he

[1] Dr. F. A. E. Crew, a great authority on the biology of sex, gives a brief statement of the preliminary problems in a paper on 'The Influence of Internal Secretions on Sex Characters,' *Brit. Med. Jour.*, 17 Sept., 1927. See also the same author's *Genetics of Sexuality in Animals* (1927); W. Blair Bell, *The Sex-Complex: A Study of the Relationships of the Internal Secretions to the Female Characteristics and Functions in Health and Disease* (2d ed., London, 1920); F. H. A. Marshall, *The Physiology of Reproduction* (2d ed., 1922). And for a sound popular account, J. R. Baker, *Sex in Man and Animals* (1926).

means by the term. Darwin, also, who wrote one of his most important books, 'The Descent of Man, and Selection in Relation to Sex,' chiefly on this subject, refrains from defining very precisely what is to be included under the term 'secondary sexual characters,' only remarking that they graduate into the primary sexual organs, and that 'unless indeed we confine the term "primary" to the reproductive glands, it is scarcely possible to decide which ought to be called primary and which secondary.' [1]

For the present purpose we shall find it convenient, though not strictly justifiable, to set aside as primary the sexual glands in each sex, and the organs for emission and reception in immediate connection with these glands. That is to say, we shall here regard the primary sexual organs as those that may fairly be regarded as essential to human reproduction. The breast, which is not necessary to reproduction, but is an auxiliary of the first importance in the propagation of the race, may be counted as the chief of the secondary characters; or else (with Darwin) as occupying a borderland between the primary and secondary characters.

The difficulty lies not so much in determining the boundary between primary and secondary sexual characters as in limiting the extension of the latter characters. A marked human secondary sexual character is the difference in the larynx and voice by which a further degree of development forms a part of male evolution at puberty, while in woman there is comparatively little development. We may perhaps define a human secondary sexual character as one which, by more highly differentiating the sexes, helps to make them more attractive to each other, and so to promote the union of the sperm-cell with the ovum-cell. The sexes are not greatly attracted by any purely æsthetic qualities; it is the womanly qualities of the

[1] *Descent of Man*, chap. VIII. On account of the uncertainty of the term 'primary sex-characters,' Poll in 1909 proposed to speak simply of genital and extra-genital sexual characters, and this terminology is occasionally used.

woman which are attractive to the man, the manly qualities of the man which are attractive to the woman. The secondary sexual characters, as thus understood, are those which indirectly favour reproduction and which might conceivably be developed by sexual selection as understood by Darwin, whether or not they actually are so developed.[1]

There are, however, other sexual differences which do not so easily fall into this group. These differences are less obvious; many of them are relative, or only perceptible when we take averages into consideration; but they are very numerous. Thus we have, for instance, the much greater shallowness, proportionately, of the female skull; we have the greater size and activity of the thyroid gland in women and the smaller average proportion of red blood corpuscles; and we have a different average relationship of the parts of the brain to each other. These differences are probably related indirectly to primary and secondary sexual differences; they are not of great importance from the zoölogical point of view, but they are of considerable interest from the anthropological point of view, very often of interest from the pathological point of view, and occasionally of great interest from the social point of view. They cannot be easily put into the same group as the secondary sexual characters as usually understood; and it is convenient to distinguish them as tertiary sexual characters.[2]

Secondary sexual characters are thus, when we put aside the primary sexual agents of procreation, those obvious sexual characters which render the sexes directly distinguishable to each other, and indirectly attractive to each other. Tertiary sexual characters are characters

[1] On this point see Havelock Ellis, 'The Analysis of the Sexual Impulse,' *Studies*, III, and J. R. Baker, *Sex in Man and Animals*, Chap. II.

[2] The conception of tertiary sexual characters, as here proposed (in 1894), has since been widely accepted. Papillault, the distinguished French anthropologist, was probably the first to adopt it in 1902. Later so eminent a representative of a past generation as Haeckel recognised this conception and adopted the term.

which are not usually obvious and are not invariably associated with the same sex, but are found on the average to predominate in one sex. Just as the primary characters merge into the secondary, so the secondary merge into the tertiary; but, when viewed centrally, primary, secondary, and tertiary characters are completely distinct. It is with secondary and tertiary sexual characters, as I have defined them, and more especially the latter, that we have here to deal.

In order to estimate the significance of each character as it comes before us, it is convenient to have standards against which to measure it. There are two standards of comparison for sexual characters in a man or in a woman which it is possible to set up, without attributing to them any strict scientific validity. The first is constituted by the child and its anatomical and physiological characteristics. The second is constituted by the characters of the aged human creature, and to some extent of the ape or the savage, although these characters are by no means always coördinate. As each character in a man or in a woman comes before us, we are apt instinctively to place it between the same characters as they appear associated with infantilism and with senility. When it is there placed, we observe whether on the whole it tends to lean towards the one side or the other, without any wish to disparage the sex in question and without reference to the larger question of the significance of infantilism or senility in the evolutionary process. These two standards of infantilism and senility, however, are of unequal value. A standard offered by the child is indeed comparatively simple and uncomplicated. The child with its relatively enormous head, its large protuberant abdomen — 'all brain and belly,' as some one defines it — its small chest, short, feeble legs, comparatively vigorous arms, smooth almost hairless skin, large liver, kidneys, thymus, and suprarenal capsules, presents a distinct anatomical picture; and the facts of the child's physiological and psychic life are also

fairly clear. But a compound standard, of simian, savage, and senile characters is incoherent. We encounter, for instance, the fact that the anthropoid apes of an early

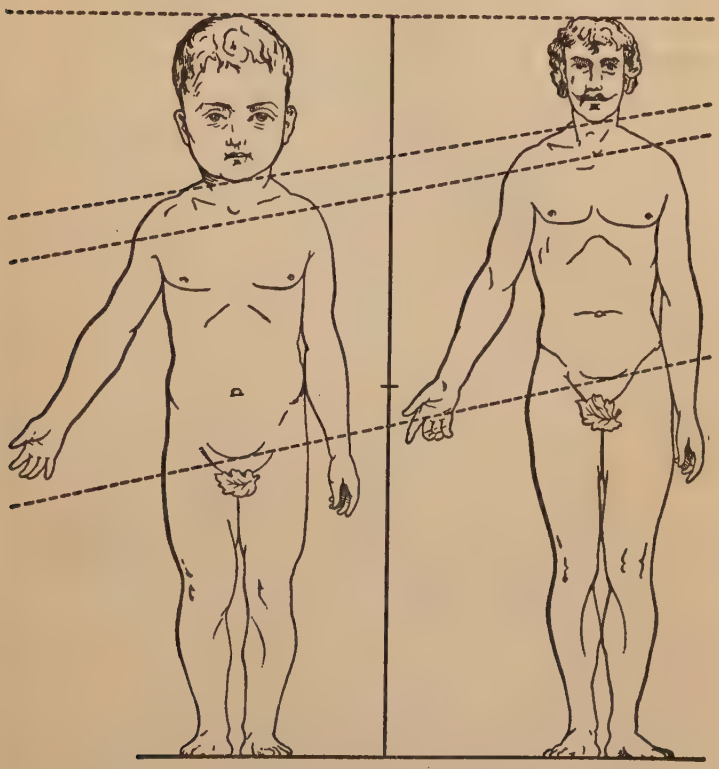
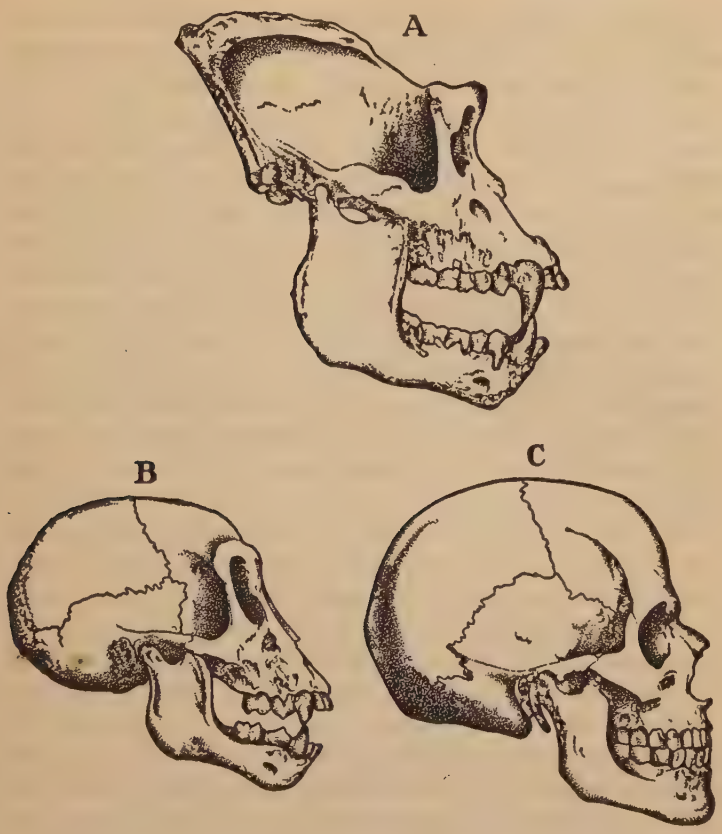


DIAGRAM SHOWING RELATIVE PROPORTIONS OF CHILD AND ADULT. (*Langer.*)

period of life often present characters unlike those they exhibit in the adult form. The young anthropoid ape is comparatively human in character, the adult comparatively bestial. The young ape has a smooth globular head and a relatively small face, as man has; the profile is more human, with little prognathism; the base of the skull also

is formed in a more human way than in the adult ape; and, above all, the brain is relatively very much larger than in the adult. If we take, for example, the gorilla, we find that the fœtus differs from the adult by having relatively a much larger head, a longer neck, a more slender trunk, shorter limbs, a longer thumb and great toe; while the head is more globular, the face less prognathous, and the hand more like a man's. In nearly all these characters indeed the fœtal gorilla approaches Man. The adult male Ape has rapidly developed into a condition far removed from his early man-like state. The brain has become relatively very small, and his receding skull has become hideous with huge bony crests, sharp angles, and on its enormously enlarged facial portion prominent outstanding superciliary ridges, projecting jaws, and receding chin; while the dark hairy body has also become more bestial in character. The female Ape remains midway between the infantile and the adult male condition, though in early anthropoid apes (like the gibbon) the sexes do not always differ greatly in structure; it is a memorable fact that the evolution of man is accompanied and furthered by increased sexual differentiation evidently ensuring a greater division of function.

So far as Man is ape-like, it is, on the whole, the infantile and not the adult Ape whom he resembles. Man also in the course of his life falls away more and more from the specifically human type of his early years, but the Ape in the course of life goes much farther along the road of degradation and premature senility. The Ape starts in life with a considerable human endowment, but in the course of life falls far away from it; Man starts with a still greater portion of human or ultra-human endowment, and to a less extent falls from it in adult life, moving, though only slightly, toward the Ape. It seems that up to birth, or shortly afterwards, in the higher mammals such as the Apes and Man, there is a rapid and vigorous movement along the line of upward zoölogical evolution, but that a time comes when this fœtal or infantile development



A. SKULL OF ADULT GORILLA. B. SKULL OF YOUNG GORILLA
C. SKULL OF MAN. (*British Museum Guide to Mammalia.*)

ceases to be upward, but is directed to answer to the life-wants of the particular species, so that henceforth and through life there is chiefly a development of lower characters, a slow movement towards degeneration and senility, although a movement that is absolutely necessary to ensure the preservation and stability of the individual and the species. We might say that the fœtal evolution which takes place sheltered from the world is in an abstractly

upward direction, but that after birth all further development is merely a concrete adaptation to the environment, without regard to upward zoölogical movement.

We see, therefore, that the infantile condition in both the Apes and Man is somewhat alike and approximates to the human condition; the adult condition of both also tends to be somewhat alike and approximates, however faintly, to the ape-like condition. The phenomena which we find among the lower human races are in harmony with those we find among the Apes and in Man generally, although the divergences are so wide that we cannot speak definitely. In some respects some of the black races may be said to be more highly evolved than the white European races. Thus the short body and long legs which we usually find among Negroes are far removed from the simian condition, and equally far removed from the infantile condition. On the whole, it may be said that the yellow races are nearest to the infantile condition; Negroes and Australians are farthest removed from it, often although not always in the direction of the Ape; while the white races occupy an intermediate position. In certain characters, however, the adult European is distinctly at the farthest remove as well from the simian and the savage as from the infantile condition; this is especially so as regards the nose, which only reaches full development in the adult white. In some other respects, as in the amount of hair on the body, the adult European recedes both from the specifically human and from the infantile condition, and remotely approaches the Ape.

The variations and uncertainties are so considerable that we can never assume that because a given character is simian or savage or senile, it belongs to all three groups; nor can we base arguments on any such assumed identity of the three groups. Practically, however, we do find that these three groups agree in various particulars to furnish characters which are removed to the farthest extremity from the child. Such characters are the comparatively

small head, the large and fierce face, the long limbs, the general tendency to hairiness, the dark and wrinkled skin, the comparative absence, usually, of fat and the exaggeration of the muscular and bony systems, a general tendency to ossification, and on the nervous and mental side a general inclination to rigidity and routine. Such characters are usually, though not invariably, simian, savage, and senile. So that we have on the one side the group of immature characters, and on the other side the group of overmature characters; and any characteristic of the male or female adult individual may lean in either of these directions. That is why these two groups of characters are frequently taken as standards of comparison when differences between the sexes are measured and discussed.

It is interesting, but we must be careful not to attach to such standards a significance they do not possess. To employ them, as is occasionally done, for the disparagement of either sex is meaningless. As we shall see, it is possible to say, and is often said, that while various average characteristics of man are nearer to the senile type than are the corresponding characteristics of woman, various average characteristics of woman are nearer to the infantile type than are the corresponding characteristics of man. No disparagement can thus be inferred, in part because, as has already been indicated, it is possible to regard the infantile form as in some morphological respects the most evolutionarily advanced form of the species, and also because we are bound to assume the complete adequacy of each sex to its special functions, and since each of its special characters has been slowly established during a practically infinite period of active experience in the world, in which the unfit have been constantly eliminated, we must accept the virtual perfection of each sex. That assumption must always be made.

It is necessary to be clear on this point, as the question of morphological infantilism has in the past often been brought up in connection with women. It will be seen,

as we advance, that there really are a number of points in which women are nearer to the infantile than are men. But this does not argue infantilism and still less inferiority. The late Professor Giuffrida-Ruggeri of Rome, a distinguished anthropological anatomist, constantly recurred to this subject, which, as he himself remarked, was his favourite theme. He argued, with much precision and acuteness, that there was no true infantilism of women, and that, so far as there was any appearance of it, no inferiority could be inferred. He criticised some statements of mine, but substantially we were in friendly agreement. Each sex is completely adequate to its functions and completely developed. Anthropological phenomena are exceedingly complex, and if we find here and there characters which we may call 'infantile,' we are only using the term, said Giuffrida-Ruggeri, in a 'quasi-philosophical sense.'

Even, therefore, when the facts of secondary sexual differences are fairly established, there is sometimes a certain difficulty in arriving at the significance of the facts. It has to be added, as a further difficulty, that the facts themselves are in a very large number of cases by no means well established. Few persons have made it their business to ascertain sexual differences; such differences have most usually come to light incidentally in the course of more general investigations. Again, those sexual differences which I call tertiary, being merely a matter of averages, in order to obtain reliable results not only must the investigation be accurately and uniformly carried out, it must be extended to a large number of individuals. By confining our observations to a small number of individuals, we either reach results that are expected or that are unexpected; in the former case we accept them without question; in the latter case we suspect a fallacy and reject them. Thus, for example, Quetelet, an unreliable statistician but a man of genius who did much to open out new lines of investigation and to place the knowledge of man on a sure basis, used to draw his conclusions from a few selected

cases which he regarded as typical. This was a thoroughly vicious method which could only lead to expected results. Thus he prepared a table to show the comparative height and weight of men and women of all ages; this table shows with beautiful uniformity that at no age are females taller or heavier than males. Subsequent investigation, on a more extensive scale and in a large number of countries, has shown that during certain years of development girls are distinctly heavier and taller than boys. This fact was not suspected in Quetelet's time, and it is evident that if in his group of cases of boys and girls at the age of thirteen he had found that the girls were heavier and taller than the boys, he would have said to himself: 'This result is so extremely improbable and at variance with my other results, that I have evidently committed an error of judgment here.' Then he would perhaps select a fresh series of cases, and if the result happened to reverse his previous questionable result, he would be at once reassured in his error. Again, until quite recent times it has over and over again been emphatically stated by brain anatomists that the frontal region is relatively larger in men, the parietal in women. This conclusion is now beginning to be regarded as the reverse of the truth, but we have to recognise that it was inevitable. It was firmly believed that the frontal region is the seat of all the highest and most abstract intellectual processes, and if on examining a dozen or two brains an anatomist found himself landed in the conclusion that the frontal region is relatively large in women, the probability is that he would feel he had reached a conclusion that was absurd. It may, indeed, be said that it is only since it has become known that the frontal region of the brain is of greater relative extent in the Ape than it is in Man, and has no special connection with the higher intellectual processes, that it has become possible to recognise the fact that that region is relatively more extensive in women. It is only in the case of observations which are carefully and methodically carried out on a

large number of subjects, and without prepossession — as in the case of Broca's brain registers, which were not worked out until after his death — that results can be obtained which cannot be questioned.

We have to recognise, it will be seen, not merely the difficulties which come from too small a number of observations, where we have the resource of putting one series of observations against another, but also the more serious difficulty of inevitable bias in the investigator's mind. This bias has an unfortunate tendency to run on similar lines, so that we gain nothing by putting one observer's results against another observer's results. Or, again, the results obtained by two observers, each working in accordance with his own bias, may be so disparate that there is no comparison. Thus one conscientious investigator (like Manouvrier) may find that all the facts of anatomy and physiology point to the superiority of women; another, equally conscientious (like Delaunay), may find that they all point to the superiority of men.[1]

I have endeavoured to set in the clearest light those facts of sexual difference which may be regarded as fairly well ascertained by a large number of observations in the hands of numerous competent investigators. So far as possible, I have ignored or placed in the background those facts which are still unsettled. In many cases I have been able to place side by side facts which, although by no means necessarily new, had not previously been placed in a juxtaposition which brought out their significance. In other cases I have found, after much trouble and inquiry, even on matters where precise knowledge seemed easily attainable, that the results so far reached are so contradictory or incomplete that nothing can be done with them.

[1] Delaunay's work is contained in his *Études de Biologie Comparée* (1878). Manouvrier's earliest investigations in this field date from the year in which Delaunay's studies were published, but his mature conclusions will be found in the *Revue de l'École d'Anthropologie*, more especially for December, 1903, August, 1906, and February, 1909. Manouvrier was probably the earliest anthropologist of note who gave reasons for believing that the natural facts in this field are not inconsistent with the claims of feminism.

Occasionally I have noted such results in passing, merely to indicate how the matter in question at present stands. An incomplete or unsupported result may at least serve as the stimulus to a more conclusive investigation. With this thought I have willingly exposed the painfully barren tracts in our knowledge of secondary and tertiary sexual characters.[1]

[1] While the present work in its original form, as published in 1894, was the first attempt to deal comprehensively with human secondary sexual characters from a modern standpoint, there were some earlier attempts, especially in Germany. In 1788, Ackermann published a careful little treatise on the anatomical differences of the sexes outside the genital while, early in the nineteenth century, a German physiologist of genius, Burdach, dealt more freely and boldly, often with much insight, though in too speculative a spirit, with numerous aspects of human sex distinction. During the past thirty years a number of books as well as of special investigations have appeared in various countries; many of them will be referred to from time to time in the following pages and no bibliography need here be given. Special mention may, however, be made of Ploss's *Das Weib* (11th ed. in three volumes, edited by F. von Reitzenstein, 1927), as it is a treasure-house of data concerning anthropological and ethnographic sex differences, especially among the lower human races. Secondary sex differences are more and more being regarded as manifestations of internal glandular activity, and the study of this important biological aspect of the subject may be said to have been initiated by Tandler and Grosz in their book on the biological foundations of the secondary sex-characters, published in Berlin in 1913.

CHAPTER III

METABOLISM

The meaning of metabolism — Basal metabolism — Calcium metabolism — Influence of the thyroid in pregnancy — Basal metabolism greater in males.

Respiration — Vital capacity greater in men — Men produce more carbonic acid — Costal respiration of women and abdominal respiration of men — This difference is purely artificial — The origin of corsets — Development of the chest — Its relation to consumption.

The blood — Red corpuscles more numerous in men — Amount of hæmoglobin greater in men — Specific gravity higher in men — The sexual differences in the blood coincide with the appearance of puberty — The pulse-rate — Always higher in small than in large animals — Sexual differences in the human and other species — Temperature.

Nutrition and excretion — Girls often better nourished — Alleged gluttony of women — Urine and urea — Special influences affecting women.

Susceptibility to poisons — Sexual differences in the selective action of poisons on different organs — Arsenic — Opium — Mercury — Special sexual susceptibilities to poisons — Chloroform — Lead — Alcohol — The best example of sexual selective action on nervous system — Tends to attack the brain in men, the spinal cord in women — Tobacco.

Hair and pigmentation — Hormonic influences — Sexual differences in distribution, etc., of hair — The eyes and probably hair are darker in women — Possible advantages of pigmentation.

By 'metabolism' we mean the vital physico-chemical changes in the organism, or the mechanism for the maintenance of the ever-burning flame in which life at its source consists. We here reach a central focus of energy which is too deep for any obvious sexual differences to be easily discerned. That is fortunate, for in this field we thus escape, for the most part, those popular and so often fallacious generalisations which have done so much to obscure the problems of sexual differentiation. Yet nowhere perhaps so much as here are sexual differences so clear to exact investigation, or so significant. The finer, and probably the more important, have not yet been worked out, though some day, perhaps, as Blair Bell remarks, we may be able to base our knowledge of sex differences on the variations, quantitative and qualitative, in the primary sex-characteristics of the internal secretory organs.

Comparisons are in this matter usually made with reference to what is called 'basal metabolism.' Such basal metabolism is the total of the vital activities in the resting stage of the organism when no active absorption is going on; that is to say, it is the minimum metabolism necessary for the maintenance of life when there are no extraneous disturbing factors.

Before discussing some of the measurable sex differences in basal metabolism it may be well to refer to a fundamental influence on the sexual differentiation of the organism. As we know, male characteristics and female characteristics are maintained by the internal secretions of the ductless, endocrine, or hormonopoietic organs. These organs in the combination of their different and frequently varying activities support and modify masculinity and femininity, and at times approximate one sex to the other. This potentiality appears to be concentrated in — apart from the genital glands — the suprarenals, the pituitary, and perhaps the pineal. It may be that, as Blair Bell holds, if our knowledge was sufficiently exact we could find a primary sex-characterisation, male or female, for each of the ductless glands.[1] All these glands support each other, or hold each other in balance, or exert a varying influence at different periods of life or in the different sexes.

The highly important calcium metabolism may here be instanced. Calcium and the lime salts perhaps play the most important and obvious part in sexually differentiated metabolism. On the whole, it may be said that there is stability of calcium metabolism in man, instability in woman. The male skeleton, as we know, is heavier and stronger than the female, and this condition is associated with considerable calcium retention during growth. After puberty the calcium plays a part in reproduction, and in senility it is liable to be retained in the tissues, especially in the arteries, so rendering them brittle. In women this

[1] W. Blair Bell, *The Sex-Complex*, 14.

tendency is modified, largely, it appears, by the influence of the ovaries, which are katabolic in regard to the calcium salts; so that there is less calcium retention in women during growth, unless the ductless glands which promote storage of calcium (especially the suprarenals and the pituitary) happen to be unusually active, and then the woman tends to display masculine characteristics. Moreover, in women, rapid alterations in the metabolism of lime salts occur during menstruation, pregnancy, and lactation. In menstruation there is a large excretion of calcium, which may explain why girls who menstruate early tend to be short and those who menstruate later tend to be tall. In pregnancy, on the other hand, there is needed, as in man, a special retention of calcium, not for the woman's own organism but for the child, though in the absence of the fœtus the same amount of calcium retention would produce masculine traits in the woman. In lactation, again, calcium salts are largely used up for the formation of milk. After the change of life, the woman's calcium metabolism settles down, but in the absence of the active ovarian secretion which had before led to its elimination, it is more apt to be deposited in the tissues and so may play a part in the disturbances liable to occur at the menopause. On the whole, the pituitary, the suprarenals, and the pineal, which promote the regular function of masculine calcium retention, act more irregularly in women, and this comparative feminine instability of metabolism — with which the ovaries and the closely sympathetic thyroid are most concerned — is the reason why women are specially liable to suffer from disorder of the ovaries and the thyroid.[1]

The thyroid is a gland we constantly come upon when we are concerned with the special metabolic processes of women. In the present connection reference may be made to the functions of the thyroid in pregnancy. In the absence of thyroid secretion, a woman cannot conceive or

[1] W. Blair Bell, *The Sex-Complex*, 18, 121, 175.

even menstruate, and where pregnancy occurs the thyroid is taxed to its full limits and is found to be enlarged. Peralta Ramos and Schteingart by experimental research and clinical observation have found reason to believe that the thyroid influences both mother and child during pregnancy. They tried to determine the basal metabolism of pregnant women as shown by heat production at the different periods of gestation and how the thyroid responds. In 61 per cent cases the basal metabolism was increased, as shown by augmented heat production, especially during the latter stages. The thyroid, controlling the heat output of the organism, is an important factor in the increase of basal metabolism during pregnancy. The increased heat output is physiologically necessary to balance the energy expended in fœtal development, and women, who in normal condition show slight under-activity of the thyroid, may compensate by increased activity during pregnancy of other endocrine glands.[1] If we find, as we shall find, that in ordinary life masculine basal metabolism is higher than feminine, we must remember that — as in the special case of calcium metabolism — this lower metabolism is compensated by high metabolism during the special circumstances of women's life.

That the general and ordinary metabolism of women is less than that of men was long since concluded by Sodén and Tigerstedt on the strength of their investigations. They found that the carbon dioxide production of girls, both per kilogram of body weight and per square metre of body (as computed by the Meeh formula), is to that of boys as 100 to 141. This was in fair harmony with some earlier investigations such as those of Andral and Gavarret, who found that, from the age of eight, when the boy's carbon consumption is already greater, it rises rapidly until at puberty it is almost double the girl's which remains almost stationary. Sodén and Tigerstedt, however, only

[1] *Gynécol. et Obstét.*, May, 1927.

found the greater metabolism of males very pronounced at the age of puberty, while Magnus Lévy and Falk found no important sexual difference either in childhood or puberty. More recently the question of basal metabolism in childhood and puberty was investigated by Benedict and Talbot. They found that the sexual differences in total calories to body weight are not obvious to casual inspection and do not exist from birth to a weight of eleven kilograms, but that there is subsequently a tendency for boys to have a somewhat higher metabolism than girls, and these investigators present a diagram showing a gradually increasing divergence. 'It is evident,' they conclude, 'that the metabolism of boys and men is for practically the entire period of life perceptibly and constantly higher than that of girls and women.' [1]

It may be pointed out, without necessarily questioning the conclusion of the greater general metabolic activity of men, which seems to be in harmony with the special metabolic activity of women, that these results in early life have usually been made on school children. Now school children are not living under absolutely 'natural' conditions, and it is conceivable that their metabolism processes are thereby modified. As a matter of fact, we know definitely that they are thus modified, even in all countries where the matter has been investigated, and sometimes to a serious extent. Such modifications affect both sexes, but we know that, sometimes and to some extent, they affect girls more, since girls seem less able than boys to react against the mischievous artificial influence of ordinary school life.[2]

[1] Benedict and Talbot, *Metabolism and Growth from Birth to Puberty* (Washington, 1921), 178.

[2] L. M. Terman, some years ago, brought together the results of many investigators in various lands showing the serious results of school life on metabolism ('Effects of School Life upon the Nutritive Processes,' *Pop. Sci. Monthly*, 1914), and it is unlikely that conditions have greatly improved.

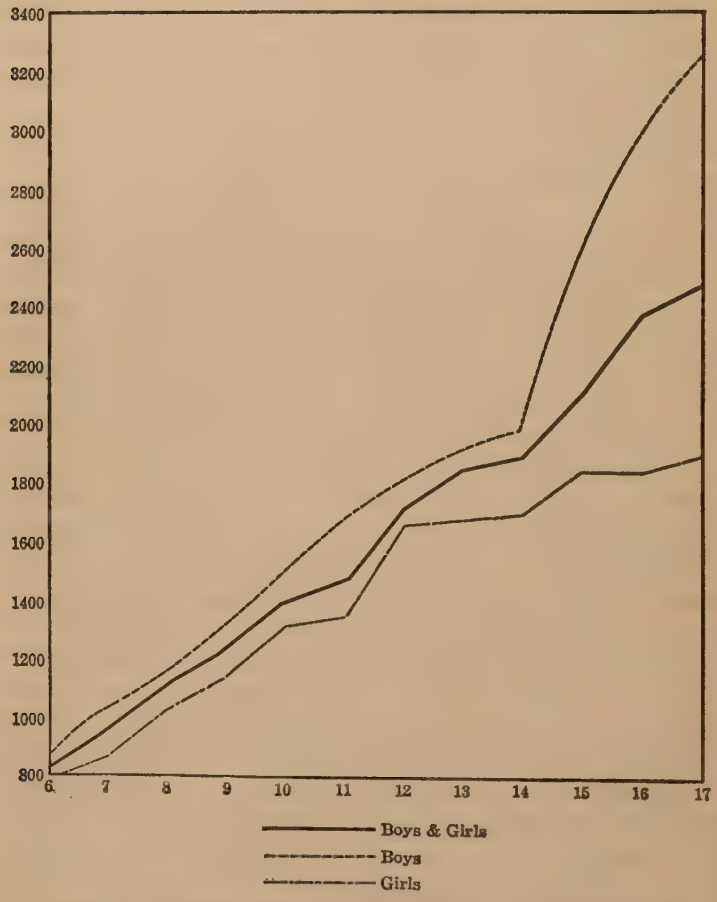
RESPIRATION

It is well recognised that the 'vital capacity,' as breathing power indicated by the spirometer is commonly called, is decidedly less in women than in men. Even during that stage of the evolution of puberty when the girl is heavier and taller than the boy, she is still, as Pagliani and others have shown, markedly inferior in vital capacity as well as in muscular force. Even in Philippine Island children, among whom at about the age of 12, girls surpass boys in all other respects, Bobbitt found that to a slight degree boys excel girls in vital capacity. At the age of 13, it was the only respect in which they surpassed them. Gilbert found, by the examination of several thousand school children, at New Haven and at Iowa,[1] between the ages of 6 and 19, that the boys were throughout superior in lung capacity; the difference was slight until the age of 12, but while the girls had almost reached their maximum lung capacity at that age, it was not until after the age of 13 that the period of most rapid increase even began in boys. Among the Iowa children, who were better developed than those at New Haven, it is noteworthy that not only was the lung capacity greater in both sexes, but that the initial difference between the sexes was less. In adult age, when there is the same height and circumference of chest, the ratio is 10 to 7 (Halliburton). The vital capacity of a man 1½ m. in height is usually 2350 c. cm.; in a woman of the same height, 2000 c. cm. (M'Kendrick). The vital capacity is 3 litres in women to 3½ in men, at equal height the volume expired being 700 c. cm. less in women. In France Demenet, comparing 100 men to 100 women, found that at ages 20 to 25, the vital capacity of men is 3.912 c. cm., and of women 2.747, a difference of 1.165 in favour of men, man to woman being as 100 to 70. The corset diminished vital capacity by one-sixth.[2] Ac-

[1] J. A. Gilbert, *Studies from the Yale Psychological Laboratory* (1894), 75; *ibid., Iowa University Studies* (1897), 23.

[2] E. Demenet, *Bull. Soc. d'Anth. Paris*, nos. 1 and 2 (1905).

cording to Arnold, for an increase in height of 25 cm., there is in men an increase in vital capacity of 150 c. cm., in women of only 130 c. cm. (Delaunay). The investigations of the British Association have shown that in England in males the mid-breathing capacity is 217 c. in., in females about 132 c. in., the maximum difference being at the ages of 20–40, after which there is a regular decrease in the



LUNG CAPACITY OF NEW HAVEN CHILDREN. (*Gilbert.*)

breathing capacity of men, but less falling off in that of women.

Some interesting comparative observations with regard to vital capacity have been made in England by Dr. Lucy Cripps, the comparison being between the results obtained with over 1000 men who were candidates for the Royal Air Force and three groups of women, each group comprising between 100 and 300 individuals: (1) Bedford College students; (2) South-Western Polytechnic Physical Training School students; and (3) Somerset House Civil servants (typists, clerks, etc.). The Training College women had all been passed as medically fit, and they wore no corsets or other constricting garment; the tests applied were the same, under the same conditions and with the same technique, as applied to the Air Force men. The vital capacity was lower in the women, as was to be expected, since larynx, trachea, and lungs are larger in men. The breath-holding tests also showed that the men could hold their breath longer, the increased carbon dioxide tension of the blood thus becoming an irresistible stimulus more quickly in the women; though it is, of course, possible that there is a psychological factor and that the women have less ability to withstand unpleasant sensations. The expiratory force of the women, as might be anticipated, was less than that of the men. When the three groups of women were compared, the Polytechnic students, who lead an outdoor life, with regular physical exercises and games, stood at the head; the Bedford College girls, who mostly play games but wear corsets, came next, and the Civil servants, who lead a sedentary life and wear corsets, came last. It was found among the Polytechnic students that those in the third year on the whole gave less good results than those in the first year, and it is suggested that they were perhaps overtrained.[1]

In association with vital capacity, chest circumference is

[1] Lucy D. Cripps, *The Application of Air Force Tests to Men and Women* (London, 1924).

somewhat inferior in women, though to a less degree. Lucy Hoesch-Ernst found that girls in Switzerland were at all ages inferior to boys, though superior in other respects for some years; but Weissenberg found, among South Russian Jews, that the circumference of the chest is, relatively, greater in women. An indication that there is no real fundamental superiority of men in chest circumference is furnished by the comparison of boys with girls of slightly superior social class. The college girls of North London, measured by Dr. J. Cock (in expiration, under the arms, above breasts), are superior up to the age of 15, and like the boys and girls are still developing in this respect at 18, though at a much slower rate.

The number of respirations at birth is 44 per minute, and gradually decreases to 18 in the adult, being very slightly higher in women than in men (Quetelet). Size has much to do with the number of respirations in every zoölogical group; thus the rhinoceros has 6 respirations a minute, the rat 210. This matter has been studied by Richet,[1] who argues that it is one of the greatest laws of comparative physiology that 'all the functions in their activity and in their intensity are determined by the size of the animal.' According to Sibson, the ratio of inspiration to expiration in male adults is 6 to 7; in women, children, and old persons, 6 to 8 or 9; other observers give rather different results.

It has been stated that, as compared to men, women have a less keen need of air. This was noted by Burdach, who remarked that it began at birth. It is said that when both men and women are exposed to charcoal fumes, women, having less need of oxygen, possess a greater chance of surviving. In the process of salt-making, according to Sidney Webb, it is found that women can work better than men in the heat of stoves. The same result has been alleged to follow when the privation of oxygen is due to extreme altitude, so that women can live at heights

[1] *La Chaleur Animale.*

where men would soon fall ill (Delaunay). It may be noted in this connection that women criminals have survived hanging much more frequently than men, from the time of Tiretta de Balsham, who was pardoned by Henry III in 1264 because she had survived hanging, onwards; sometimes they have revived from the jolting of the cart on being conveyed from the gallows, and at other times by the skill of surgeons to whom the body had been given for anatomical purposes; Sir William Petty acquired popular fame by thus restoring to life a woman who soon afterwards married and lived for fifteen years.

During normal respiration in civilised races, according to the traditional doctrine, man's respiration is *diaphragmatic* or *abdominal*, woman's is *costal*, the chest chiefly moving. Boerhaave noticed the difference of type in male and female infants; this has not, however, been confirmed by later investigators. It is now, as Ballantyne remarks, 'usually admitted that respiration is chiefly abdominal in type during the first three years of life.' The diaphragm is thus the most important respiratory muscle in the infant as well as in the adult male, or to an even greater extent. The costal breathing of women begins, according to Sibson, about the tenth year of life, and he, as well as Walshe and other investigators, attributed its appearance to the use of corsets and similar external impediments. But Jonathan Hutchinson, who studied the matter carefully, came to the conclusion that the difference of breathing was not due to the restraints of clothing, for he found costal breathing in young girls who had never worn tight-fitting clothes. He argued that it was a natural adaptation to the child-bearing function in women. Hutchinson's investigations were for many years accepted as final.

During the last forty years, however, fresh investigations, on a wider basis and with more accurate methods, have changed the accepted aspect of the matter. At the Birmingham meeting of the British Medical Association in 1890, Dr. Wilberforce Smith read a paper concerning

some investigations he had made 'On the Alleged Difference between Male and Female Respiratory Movements.' [1] Using Burdon Sanderson's stethograph in a modified form, Smith took tracings of about fifty persons. The dress was entirely loosened; and it was rightly regarded as of considerable importance to keep the subject of the experiment ignorant of its object. It was found that at the sternal level of the chest in both sexes there was free respiratory movement. The most characteristic differences occurred just below the naval: among the men a principal group showed free movement, while a smaller group, having soft abdominal walls, only showed slight movement; among the women, habitually dressed and corseted in the manner then usual, a large group showed excessive diminution or entire abolition of movement, while a smaller group of young and muscular women, wearing corsets, retained free movement; among women habitually wearing no corsets, a large group showed free movement in no degree less marked than among males, and in at least one case actually freer than among most males, and a smaller group of non-corseted women, having soft abdominal walls, showed only slight movement. Smith also independently examined nine ayahs; they all wore Oriental dress and had all borne more than one child. Without exception they exhibited respiratory movement below the navel not less free than in average English men.

As a result of his investigations, Wilberforce Smith concluded 'that the tracings exhibited tended to invalidate the routine physiological teaching that there is a natural difference in the respiratory movements of the sexes, and they tended to confirm the belief of Sibson that the alleged difference is chiefly or wholly due to the effects of woman's conventional dress.' Cunningham, after the paper was read, remarked that these physiological experiments confirmed his own views, founded on anatomical grounds, that there ought to be no essential difference in respiratory

[1] *Brit. Med. Jour.*, 11 Oct., 1890.

movements in man and woman. Charpy, I may add, had also previously come to the conclusion, from extensive anatomical investigations, that up to the age of fifteen boys and girls have identical chests, and that the thoracic type of breathing is only found in women of at least twenty-five years of age who bear on their viscera, especially the liver, signs of deformation produced by tight clothing.

Simultaneously with the publication of Smith's investigations, additional evidence on the same point from America was published in a paper by Professor H. Sewall (Michigan University) and Myra Pollard.[1] Some original observations were here given by Dr. Mays, of Philadelphia, made by means of the graphical method on the respiratory movements of female descendants of an uncivilised race. He writes: 'In all I examined the movements of 82 chests, and in each case took an abdominal and a costal tracing. The girls were partly pure and partly mixed with white blood, and their ages ranged from between ten and twenty years. Those who showed the costal type, or divergence from the abdominal type, came from the more civilised tribes, like the Mohawks and Chippewas, and were either one-half or three-fourths white; while in no single instance did a full-blooded Indian girl possess this type of breathing.' Dr. J. H. Kellogg, of Michigan, supplied evidence to the same effect: 'I observed the breathing of 20 Chinese women and the same number of Indian women, and I found the abdominal type very marked in every case. The tracings given by the Chinese women were not like those of robust men, but were identical with those from men of sedentary habits. . . . Of the Indian women 14 were of the Yuma tribe, the most primitive Indians in the United States. . . . The majority of them still wear their bark dresses; the only garment in addition to this is a long strip of red cloth thrown over the shoulders and folded about the body. . . . The waist is not restrained in the slightest

[1] *Journal of Physiology*, 1890, no. 3.

degree. In these women the abdominal movements were 4 to 6 times as great as the costal movements. I examined several of the Cherokee and Chickesaw women in the Indian Territory. These women had all worn civilised dress, and some of them had worn corsets. Those who had worn corsets and tight dresses gave tracings like civilised women; those who had worn only loose dress gave normal tracings. I also found a few civilised women who had never worn corsets or tight bands, and obtained from them tracings like those from the Chinese and Yuma women.'

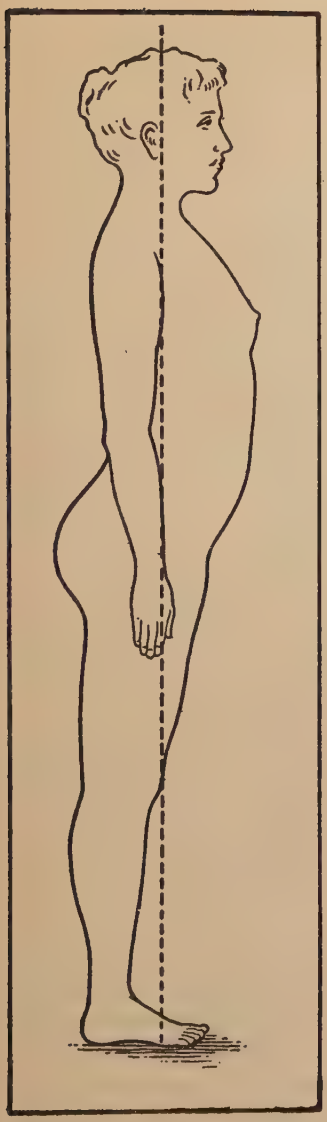
Kellogg made later various series of observations on women in different parts of the world which confirm and extend these conclusions.[1] The two accompanying figures are reproduced from Kellogg's pamphlet. One represents a German peasant woman, aged twenty-nine, who had never been trained in gymnastics, but who had been accustomed to carry heavy weights on her head up to the age of twenty; she shows the natural female form. The other figure is that of an ordinary American woman of the same age, who wore the ordinary civilised dress and took little exercise. When in England, Dr. Kellogg went to the 'black country' to study the women nail-makers and brick-makers, and found among them some of the best developed women he had ever seen. He ascertained also that they are extremely healthy.

The evidence clearly points to the conclusion that the sexual differences in respiration found among civilised races are not as was formerly supposed, natural secondary sexual characters, but merely the result of the artificial constriction of the chest formerly practised by women.

The feminine custom of constricting the waist began at an early period, no doubt in prehistoric times. The wall paintings of the palace of Minos in Crete show women with artificial waists. In ancient Egypt men as well as women wore small corsets.[2] The Greeks of the finest period knew

[1] 'The Value of Exercise,' *Trans. Am. Assoc. Obstetricians*, III (1891), and an interesting pamphlet on *The Influence of Dress*, both fully illustrated.

[2] On the corset in art, see Félix Regnault, *Æsculape*, March, 1913.



GERMAN PEASANT WOMAN

AMERICAN WOMAN

(*After Kellogg.*)

nothing of the corset, but during the period of decadence women began to compress the body with the apparent object of emphasising the sexual attraction of a conspicuously large pelvis. Hippocrates vigorously denounced the women of Cos for constricting the waist with a girdle. Among the Romans, who adopted this practice from the Greeks of the second century before Christ, Martial often alludes to the small waists of the women of his time, and Galen speaks much in the same way as a modern physician regarding the evils of tight-lacing. The apparent development of the pelvis has sometimes been further exaggerated by that contrivance which in Elizabethan times was called a 'bumroll,' and more recently a 'bustle.' The tightening of the waist does not merely emphasise the pelvic sexual characters; it also emphasises the not less important thoracic sexual characters.[1] As Dr. Louis Robinson expressed it (in a private letter): 'I think it very likely one of the reasons (and there must be strong ones) for the persistent habit of tightening up the belly-girth among Christian damsels is that such constriction renders the breathing thoracic, and so advertises the alluring bosom by keeping it in constant and manifest movement. The heaving of a sub-clavicular sigh is likely to cause more sensation then the heaving of an epigastric or umbilical sigh.' This double effect of waist-constriction upon hips and chest is fully sufficient to account for its origin, and it was kept up partly by custom and partly from that 'sense of support' always felt by those who have for years been subjected to the practice.

All the evidence that has since appeared confirms the conclusion that there are no true and natural sexual distinctions in respiration. Thus, among the Japanese Baelz has found that only those women who bind themselves round by the broad woman's girdle (*obi*) show thoracic respiration, while the peasant women who do not thus

[1] Havelock Ellis, *Studies in the Psychology of Sex*, IV, 'Sexual Selection in Man.'

constrict themselves breathe abdominally like the men.[1] Fitz, in an important paper,[2] has also studied the whole question thoroughly, and found no sexual differences. The idea that waist-belts and corsets may perform a useful purpose in assisting the flow of blood to the brain and muscles (as suggested by Roy and Adami) appears to be without foundation; and, in any case, such methods are unnecessary, since perfect compensation is attained under normal conditions.[3] On the other hand, there is reason to believe that the influence of women's clothing in causing costal respiration and so diminishing the action of the diaphragm has an injurious influence, not only on the thoracic but also on the abdominal viscera. Thus it is everywhere found that women suffer much more from gall-stones than do men. In a careful and thorough study of this question Dr. Clelia Mosher [4] found that in America the liability of women to gall-stones is 9.4 per cent, and of men only 5.6 per cent, while in Germany the frequency of gall-stones among women is twice as great, and in the Negro race it is less. In the first line of causes for this sexual difference she mentions the costal respiration of women induced by clothing, and she refers to the experiments of Heidenhain, showing that the action of the diaphragm is an important factor in emptying the gall-bladder.

Meinert, in 1893, showed reason for believing that too tight-fitting clothes, even in those who have never worn corsets, may be a factor in the causation of anæmia, through the abdominal constriction leading to gastroptosis, or falling of the stomach, and consequent sympathetic nervous disturbances. Of 31 young girls received into the training-school for servants at Dresden, 12 of whom had never worn corsets though their clothing was too tight, 28 were found with gastroptosis; of these 17 had

[1] *Zt. f. Eth.* (1901), Heft III, 211. [2] *Jour. Exper. Med.*, I, 677.
[3] Leonard Hill, *Cerebral Circulation* (1896), 112.
[4] *Johns Hopkins Hosp. Bull.*, Aug., 1901.

chlorosis, and 3 anæmia of non-chlorotic character. Meinert referred to the fact, to which attention was drawn by Hirsch, that chlorosis was unknown in antiquity and in the Middle Ages; in Saxony it is said to have appeared among the peasant girls since they adopted modern fashions; in Persia, where no constriction of the thorax takes place, it is said by European physicians to be unknown; and in Japan only to appear among those who have adopted European dress. There can be little doubt about the association of chlorosis with constriction of the thorax.

T. Deneke [1] has published statistics showing how enormously the incidence of chlorosis has declined of late. His statistics deal with the period 1895 onwards, and his material consists of patients treated at a hospital in Hamburg. In 1901 there were about 12,000 patients admitted to this hospital, and among them there were 201 cases of chlorosis. In 1923 there were about 20,000 patients admitted to the same hospital, yet among them were only 3 suffering from chlorosis. A graphic representation of the incidence of chlorosis shows a rise from 1895 to 1901 and a very rapid decline after this year. Deneke discusses and dismisses the hypothesis that this declinè is due to early wholesale treatment with iron, and believes that woman's emancipation from tight-lacing has rid her of chlorosis, agreeing in this with Roch and Bickel. Formerly it was the fashion for girls who were inclined to be stout at the age of puberty to lace conscientiously, hardly discarding their corsets when they went to bed. The frequency with which country girls used to develop chlorosis when they moved into a town could be traced to tight-lacing being enforced more in towns than in the country. The association of fatness with chlorosis was merely an indication that the fatter the girl the more desperately did she lace herself up. The geographical distribution of chlorosis was exactly that of the corset, Persian and Jap-

[1] *Deut. med. Woch.*, 4 July, 1924.

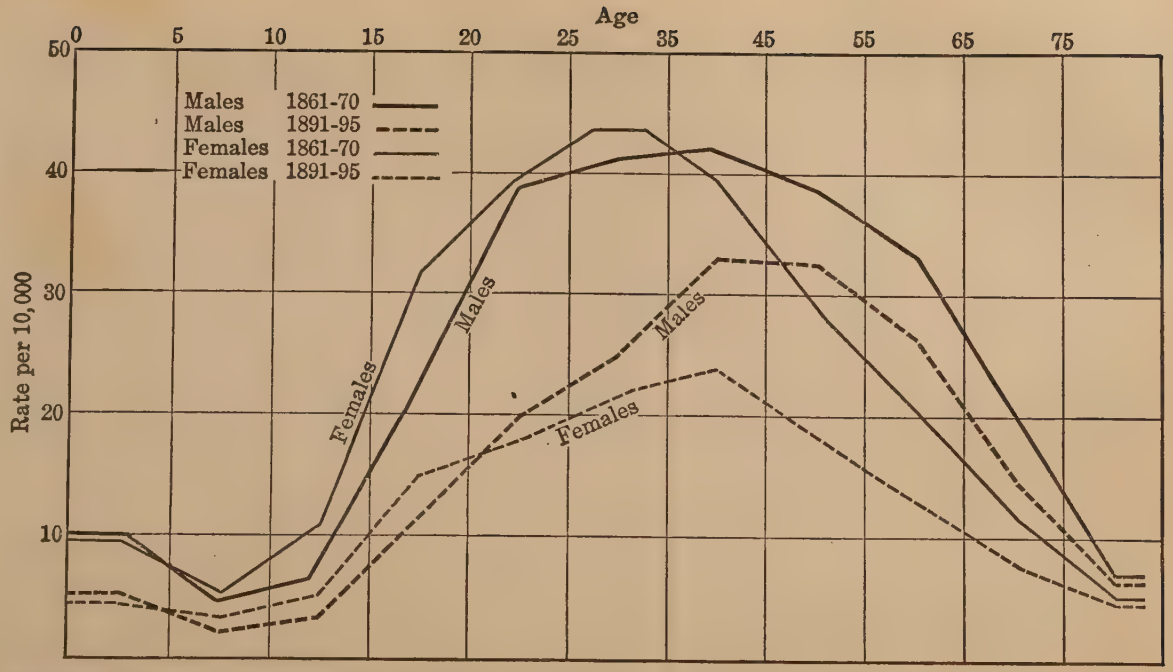
anese women being without either. Again, discarding corsets has been known to cure chlorosis without the aid of any other remedy, and the good effect of rest in bed in severe cases may be explained on the same ground. Deneke anticipates that the fashion of tight-lacing will return some day, and that the correctness of his views will then be proved by the return of chlorosis to its former frequency.

We have seen that the chest region tends to remain unduly undeveloped in women as compared to men. The vital capacity of women is inferior to that of men out of all proportion to the smaller size of women; their lungs also are unduly small; while in strength of arm and of chest muscles, they are much weaker, as compared to men, than they are in strength of leg muscles, feebleness of arms and chest being indeed, relatively to men, women's weakest point. It is probable that this condition of the chest is of significance in connection with the special tendency of young girls to become consumptive. From 1860 onwards in England and Wales the mortality of girls from phthisis, up to the age of twenty, exceeded that of boys, in sexual ratio to the population, by as much as thirty per cent.[1] Sir Hugh Beevor, who specially studied the sex incidence of phthisis,[2] traced this special liability of girls to consumption to early arrest of chest growth.[3] In later adult life the mortality of men is much greater than of women, but here we have to remember not only that the women with the least resistant lungs have already been weeded out by death, but that the influence of unwholesome occupations, and also, it is probable, the greater need of good nutrition in men, exert an important influence. Beevor's

[1] German statistics yield similar results, A. Würzburg, *Mitt. d. K. Gesundheitsamts.*, II, 96.

[2] *Lancet*, 15 April, 1899.

[3] In a subsequent paper ('Sex Constitution and its Relation to Pulmonary Tuberculosis,' *Medical Magazine*, June, 1900), Sir Hugh Beevor was inclined to regard the arrest of lung-growth and the associated greater tendency to consumption as due to ultimate differences in sex constitution. This is a conclusion which I do not think we are entitled to accept.



PHTHISIS DEATH-RATE IN ENGLAND AND WALES PER 10,000 LIVING, SHOWING DECLINE FOR BOTH SEXES IN RECENT YEARS, WHILE GREATER MORTALITY OF GIRLS BELOW AGE OF 20 IS MAINTAINED (*Beevor.*)

results received valuable confirmation in Woods Hutchinson's study of phthisis and of the consumptive chest.[1] He found that the consumptive chest really tends to exhibit a measurable degree of inferior development. It would thus appear that the special liability of girls to become the victims of this disease is in some measure due to their inferior chest development, and therefore in part avoidable, with vigorous life in the open air, and less restraint on natural activities.

It is usual for foolish parents and others to repress the impulse to climb trees, which is often felt by girls in the country. This is, however, as Hutchinson points out, precisely the kind of exercise they need to develop their chests. 'It would almost seem,' remarks Hutchinson, 'as if a reversion to the arboreal habits of our ancestors was the chief requisite for proper chest development in the individual as well as in the race. The well-marked child-instinct for tree-climbing ought to be regarded with respect in both girls and boys, even at the risk of torn clothing or an occasional broken limb.' At present the sexual difference in mortality from consumption is even more marked in rural than urban districts; although the country boy enjoys great advantages over the town boy, his sister's life is much more likely to be regulated by the same maxims as that of the town girl. The natural instinct of girls to climb trees as well as the persistency with which it is repressed are alike evidenced by the frequency with which Stanley Hall found that girls state that climbing trees is one of the things which it is 'wrong' to do.

THE BLOOD

When we reach the blood, we come close to the central metabolic process of the organism, for here we have a main medium and channel for the bio-chemical combinations and exchanges which are essential to life. Except such elementary creatures as the Protozoa, all animals

[1] *Studies in Human and Comparative Pathology*, chap. V.

possess blood, though with great variations as to constituents, character, and colour.

As we might anticipate, the blood shows essential sexual characteristics. In some caterpillars the blood of the male is yellow and of the female green — important chemical distinctions thus being indicated — and while in the human species the distinction is less obvious it is equally definite. The finer shades of difference are still to a large extent unknown, but the gross distinctions have long been recognised.

Roughly speaking, the blood of vertebrates consists of three elements, the plasma or fluid portion, the white corpuscles, and the red corpuscles. Of these, the plasma is the most primitive, and the red corpuscles the latest to appear in the course of evolution and the most important. In the human species during childhood we naturally find that there are fewer red corpuscles than in adult age, and also that the hæmoglobin (the oxygen-carrying element in the red corpuscles) is less in amount, while the white corpuscles are more abundant than in later life.

Denis, and afterwards Lecanu, were the first to draw attention to the fact that there are sexual differences in the blood; and the results of these investigators, confirmed at a somewhat later period by Becquerel and Rodier, showed that the blood of men contains less water and more red corpuscles, and is consequently of a higher specific gravity, than that of women; these statements have since often been demonstrated.

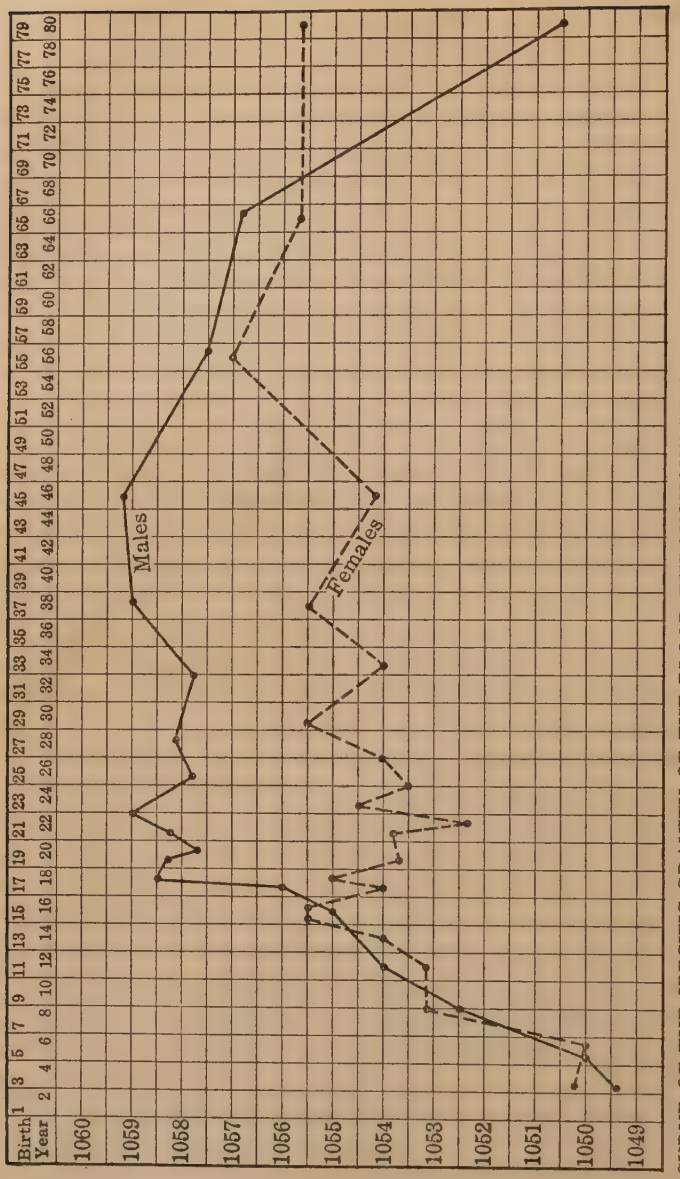
There appears to be no evidence showing conclusively that the white corpuscles are more or less numerous in women than in men,[1] but all physiological chemists are agreed that after puberty there are more red corpuscles in the male than in the female, not only in man, but also in many lower animals.

[1] Robin asserted that they are more numerous in women; Hayem has denied it. Dina Rabinowitsch, also, more recently, found that between the ages of one and fifteen there are no sexual differences in the number of leucocytes. Dilution of the blood tends, however, in general to increase of the white cells, as has been shown by, for instance, Beard and Wilcox.

Cadet found in men on an average 5,200,000 red corpuscles to 4,900,000 in women, and Korniloff, using a different method — Vierordt's spectroscope — found a similar slight difference. The number of red blood corpuscles per c. mm. is usually stated to be 5,000,000 in men, 4,500,000 in women; or, otherwise expressed, as 100 to 90. Luciani gives the same figures. During menstruation there is a reduction to the extent of from 10 to 20 per cent. As a result of the periodical hæmorrhage of menstruation, women probably have the power of re-forming blood more rapidly than men, and Luciani considers that this is probably the reason why women are, apparently, better able to bear loss of blood than men.

It is, however, by the amount of the hæmoglobin that we more accurately measure the functional power of the blood. Hæmoglobin has been described as 'perhaps the second most interesting substance in the world,' the first presumably being chlorophyll, which plays a rather similar part in the vegetable kingdom to hæmoglobin in the animal kingdom, and it is indeed by some supposed (though this is not proven) to be in evolutionary relation to it. The mysteries of hæmoglobin and of its delicate adjustments to the needs of the organism are not yet fully explained.[1] But we know at all events that it has the power of transporting oxygen and of giving it up in proper quantities where it is required; being able to expel the oxygen under the influence of carbonic acid, which is itself expelled by the oxygen from alkaline solutions containing that gas. Leichtenstern stated that women from the ages of eleven to fifty average 8 per cent less hæmoglobin than men. According to M'Kendrick, there is 14.5 per cent hæmoglobin in man's blood, 13.3 per cent in woman's; according to Preyer, it is 22 to 15 per cent in man, 11 to 13 per cent in woman; during pregnancy the amount of the hæmoglobin is only about 9 to 12 per cent. Bunge suggested that a storage of the iron in hæmoglobin

[1] J. Barcroft, *The Respiratory Function of the Blood*, Part II (1928).

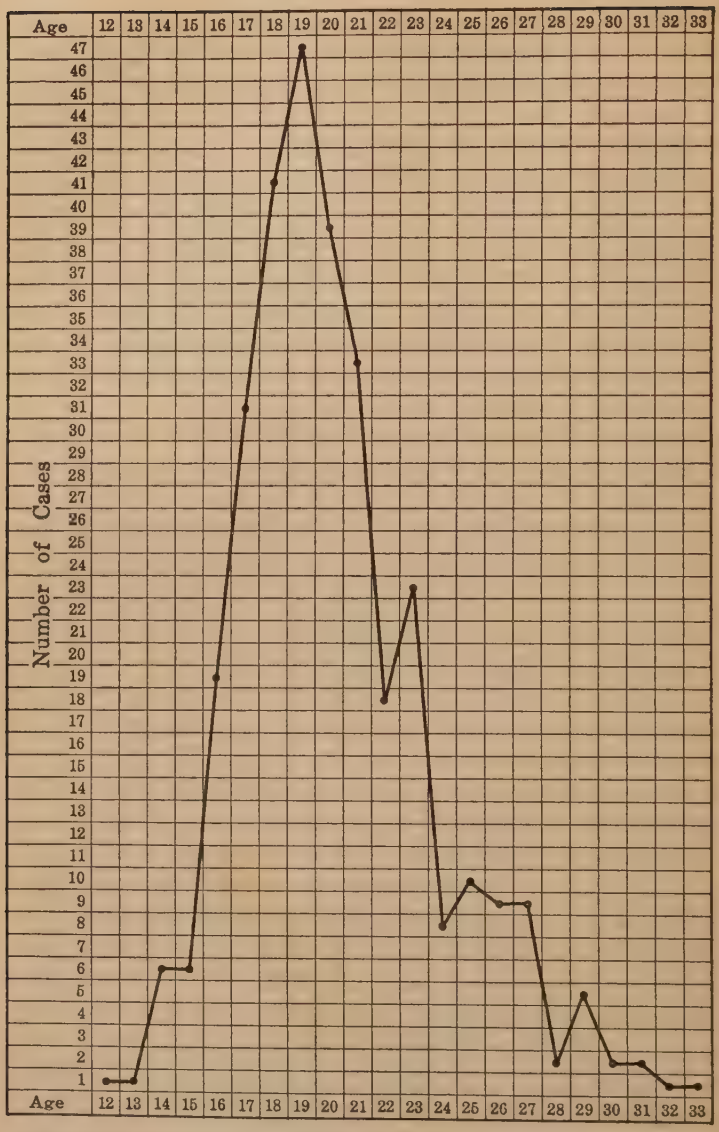


CURVE OF THE SPECIFIC GRAVITY OF THE BLOOD THROUGHOUT LIFE, ——— MALES; . . . . . FEMALES
(*Lloyd Jones.*)

takes place in the maternal organs even before the first conception, in readiness for the supply of the fœtus through the placental circulation, and he supported this position by showing that young animals contain a much greater amount of iron than adult animals. In harmony with these observations are the results of Friedjung, who found that human milk contains a small but steady amount of iron, not diminishing in the course of nursing; there is less iron in the milk of mothers of mature age, and its diminution is liable to produce derangement of nourishment in the infant. We may say, as Lloyd Jones expresses it, that this is part of a general storing up of tissue food, partly as fat, partly as proteids, and a general reduction of katabolic energy.

A convenient and widely used method for estimating the quality of the blood is by obtaining its specific gravity. It is well recognised that the specific gravity of the blood is higher in men than in women, and that it falls in pregnancy (though very slightly), after exercise, and after taking food (especially if much water is drunk). In England the specific gravity of the blood has been investigated with interesting results by Lloyd Jones.[1] He took the specific gravity of the blood (by Roy's method) of over fifteen hundred persons, in ordinary health, of both sexes and all ages, from birth to over ninety. The specific gravity, Lloyd Jones found, is at its height at birth, and although generally lower in women than in men, it is about the same in both sexes before the fifteenth year, and is higher in old women than in old men. In males the specific gravity is about 1066 at birth, and falls during the subsequent two years, being about 1050 in the third year; thence it rises till about seventeen years of age, when it is about 1058. It remains at this height during middle life, and falls slightly in old age. In females the specific gravity, starting at about 1066 at birth, falls in infancy as in males

[1] E. Lloyd Jones, *Journal of Physiology*, 1887; *ibid.*, Sept., 1891. The latter paper is a lengthy and important monograph.



AGE FREQUENCY IN 314 CASES OF CHLOROSIS (*Byrom Bramwell.*)

and then rises till the fourteenth year, when it is 1055·5. Between seventeen and forty-five years of age it is lower than at the age of fourteen, and is about three degrees lower than in men.

Lloyd Jones also pointed out that the specific gravity of the blood varies with individual constitution; it is lower in persons with light than with dark hair, eyes, and complexion. He suggested that this difference is perhaps due to the incomplete fusion of British races, and that the more watery blood may belong to the Saxon and Scandinavian elements. 'By the appearance of an individual, noting the age and sex and colour of the iris, hair, and complexion, one can form a fairly accurate estimate of what the specific gravity of his or her blood ought to be.'

Lloyd Jones further made the interesting discovery that, notwithstanding the general low specific gravity of the blood in women, the plasma in women has a somewhat higher specific gravity than in men, rising at puberty, while in men it remains stationary.

It will thus be seen that it is at puberty the sexual difference becomes marked. The appearance of menstruation coincides with low specific gravity, and the periodical recurrence of menstruation appears to produce a slight fall in the specific gravity. A noteworthy sexual difference is the great range in the specific gravity of the blood, consonantly with health, in girls from the ages of fifteen to twenty-two; and the lower limit during this period falls to a very low point. It is the age of anæmia, and Lloyd Jones suggested that chlorosis, which is essentially a disease of young women, is but an exaggeration of a condition which is physiological at this age. (See chart on previous page.) Such a suggestion would not conflict with the more recent view that tight-lacing is the exciting cause, for that might well have its effect on account of the existing predisposition.[1]

[1] It may be added that other causes of chlorosis have been put forward. Thus A. Schmitt stated that in nearly all cases of chlorosis there is disturbance of ovarian and uterine function, and he regarded that as the cause of changes in the blood.

In old women the specific gravity rises, and Lloyd Jones suggested that this rise may be a factor in the greater longevity of women. It is certain that good physique in men is associated with high specific gravity of the blood, and poor physique with a low specific gravity; the blood of Cambridge undergraduates is of high specific gravity; the blood of workhouse boys of low specific gravity.

This difference in the constitution of the blood of men and women is fundamental, and its importance cannot be exaggerated; although it is possible that its significance may be to some extent neutralised by other factors.

PULSE-RATE

The rapidity of the heart's action varies very greatly among animals, the heart beating more slowly in proportion to the animals' greater size, but the rule not being perfectly correct if we compare, for example, birds with mammals. The pulse-rate usually preserves with the respiration-rate a relation of about 4 to 1. In birds the pulse-rate is very rapid; in the mammalian series we find that the pulse-rate of the mouse is 120, that of the dog 75, of the horse 42, of the elephant 28. In the same species there are differences associated with the bulk of the organism. Large vigorous races of dogs have a slower pulse than smaller races. Seymour Taylor remarks that he has taken the pulse-rate of gigantic muscular men employed in quarrying and other laborious occupations, men of the Cumberland fells, accustomed to violent struggles in the wrestling arena but of naturally ponderous, deliberate nature, and has been surprised to find that their hearts, when at rest and in perfect health, have gone through but 60 cycles in the course of a minute, in one case only 40.[1] There are variations among human races which seem to be accounted for by considerations of size, and not, as Delaunay tried to show, by a connection between inferiority and a quick pulse: thus if we take 72, which is

[1] *Lancet*, 6 June, 1891.

Béclard's standard for the Frenchman, the pulse-rate of the small-bodied Javanese is said to be as high as 84, that of the Chinese and Nicobar Islanders 77, while Jousset states that among Asiatics and Africans generally the pulse-rate varies between 77 and 86. Among Bashkirs, however, whose average height was not more than mm. 1661, Weissenberg found that the average pulse-rate was 63.

Among nearly all animals the heart of the male beats more slowly than that of the female. In some animals, if we are to accept observations that are probably not very reliable, the differences are considerable: the lion's pulse-rate is 40 (Dubois), the lioness's 68 (Colin); the bull's 46, the heifer's 56 (Girard); the ram's 68, the sheep's 80. In the human female there is a slighter but still well-marked difference. According to Frankenhausen, the pulse-rate of the male before birth is 124 to 147, of the female 135 to 154. Depaul, from an examination of 41 male and 29 female fœtuses during pregnancy, found that the average pulse-rate in the former is 139, in the latter 142. At birth and for some time later the two sexes remain very near together; in old age the pulse-rate of women seems to have a greater tendency to increase than that of men. Guy's table of the pulse-rate according to sex and age shows greater rapidity in women at all ages, the difference being greater after the age of seventy.[1] Hare and Karn find no significant difference in the pulse-rate of pregnant and non-pregnant women, though the pulse pressure is lowered in pregnancy.

The observations of Gilbert on school children in Iowa tend to show that the pulse is not at all ages slower in boys than in girls. He found that at six the boys' pulse is slower; from then to eleven, however, faster than that of the girls; between thirteen and fourteen faster; and again slower from sixteen onwards. There appeared to be an

[1] Todd's *Cyclopædia of Anatomy and Physiology*, 181, and *Guy's Hospital Reports*, III and IV.

acceleration in both sexes at puberty, more marked in boys. Karl Pearson, however, finds a 'pubescent dip' also for vital capacity and some other physiological functions. On the whole, we may say with M'Kendrick, that, at all events in Northern Europe, 72 is the usual pulse-rate in men, 80 in women; other observers give the average difference as somewhat greater; thus, according to Hardy and Béhier, women show 10 to 14 more pulsations a minute than men. Quetelet's figures (absolutely rather lower than Guy's), giving a rather greater sexual difference for early manhood and womanhood, a rather less difference for adult age, produce the same average difference as Guy's. Accepting, therefore, Guy's careful figures, we see that the average pulse-rate of civilised women is the same as that of boys about the age of puberty. It cannot be said that this difference is very notably greater than the general physical proportions of the sexes would lead us to expect.

Of recent years much attention has been given to blood pressure, and extensive investigations have been made. They reveal pronounced individual differences, but there are also clear indications of sexual characteristics. Symonds, in America, examined nearly 142,000 applicants over 15 years of age for insurance; Alvarez and others investigated 15,000 students, men and women, on entrance at the University of California; and Stocks and Karn observed English boys. In children it is found that there is a steady rise in blood pressure from the age of 5 to 15. There is a fall in early adult life. After 40 there is a slow rise, but with no sexual differences. In early adult age the average systolic pressure, according to Alvarez, is about 125 mm. for men and 115 mm. for women; a sexual difference of the same amount at a lower level exists at the age of 16. Alvarez found that the blood pressures of women are more uniform than those of men, always tending to be about 11 mm. lower, and that at the two extremes, while there was an excess of men among the very high pressures, there was an excess of women among the

very low pressures. It is therefore suggested that ovarian extracts might be of benefit in the treatment of high blood pressure in men. Stocks and Karn find in female students uniformly lower systolic and pulse pressure, as well as an absence of correlation between systolic pressure and pulse pressure which in males is considerable. But they found no evidence that the difference can be taken as an index to physical fitness.[1] In pregnancy Hare and Karn find that systolic as well as pulse pressure is lowered.

TEMPERATURE

The evidence concerning sexual differences in temperature is small and inconsistent. We know that increased metabolic activity, as well as a greater afflux of blood, produces higher temperature. In children it is well recognised that the temperature is more liable to variations which are of much less significance than in grown-up persons. Benedict and Talbot found no pronounced sex difference in the rectal temperature of boys and girls. Davy, Roger, Mignot, and Delaunay found the temperature of men higher than that of women by about .5° C.; Ogle and Wunderlich found the temperature of women higher by about the same amount. Stockton Hough found that males have, as a rule, from the beginning to the end of life, a higher temperature than women and greater individual variations. Thierfelder found that the average temperature of women throughout the day is somewhat higher than that of men, especially in the evening, when it is half a degree higher, and occupies an intermediate place between that of children, which is higher, and of men, which is lower. Tyson states that there is little doubt that in disease the temperature of the female, both in youth and adult age, is higher than that of the male, perhaps from half to one degree. It must be remembered, however, that, as Wunderlich found, there is a

[1] Percy Stocks and M. Noel Karn, *Blood Pressure in Early Life: A Statistical Study* (London, 1924).

range of a degree and a half (from 97.2 to 98.8 F.) in the normal temperature. Waller stated that (as in children) the variations of temperature in women from time to time are greater than in men and of less significance.[1]

NUTRITION AND EXCRETION

The function of the hormonopoietic glands in elaborating and controlling the central metabolism of the organism may seem to us nowadays — in their newly discovered and fascinating aspects — to have put into the background the more obvious processes of nutrition and excretion which have always attracted attention. Yet the importance of nutrition remains and the investigations into the influences that affect it have in recent years even increased in importance by the discovery of the vitamins. Through nutrition the environment is ever acting on the organism from without, and supporting or counteracting the influences which are exerted by the hormone-producing glands from within.

In England, as shown by the reports of the Medical Officer of the Board of Education, girls are better off as regards nutrition than boys. In London as a whole it appears from the sixth annual report (1915) that 10.8 per cent of the entrant boys and 9.8 of the entrant girls showed poor and bad nutrition; while 14.7 per cent of leaver boys and 14.3 of leaver girls showed similar conditions. Taking London as a whole, the leavers were more deficient than the entrants. The districts showing the worst nutritional deterioration are those that also show excessive death-rates in infancy and from phthisis. In Cambridge 16.7 per cent of boys were defective in nutrition as compared with 13.8 of girls. Various causes are assigned for this sexual difference, and it is said that in

[1] Martius took the temperature of 85 domestic ducks — in the north and south of France — under various conditions, and found the temperature of the females higher and also more variable. Gavarret, in *Phénomènes Physiques de la Vie* (1869), 80–89, gives the temperatures of a large number of animals.

poor families the elder children suffer for the benefit of the younger children.

But the school itself and its tendency to exert over-pressure has in recent years been shown by careful comparative investigations to be a serious source of nutritive deficiency and organic defect. Terman some years ago brought together a number of such investigations from various countries and presented an impressive picture of the evils thus produced.[1] All sorts of disturbances of metabolism occur. It is found that children attending school, as compared with those not attending school, show defective growth in weight and height, the boys suffering more than the girls; that the physical effect of a school examination is often comparable to that of a severe illness, and that the resulting disturbances of metabolism can hardly fail to affect the brain; that a child's appetite deteriorates as the school year proceeds; that the superficial respiration associated with mental tasks leads to imperfect oxygenation of the blood with immediate effects on the chemical composition of the blood corpuscles, analogous to the effect of some poisons, and therefore probably due to the formation of a toxin, the result of fatigue; that there is a great increase in physical defectiveness with the length of the school course, so that a percentage of 18.4 serious chronic defects becomes 34 per cent at the end of the third year, and at the end of the eighth year (with an average of 8½ hours of daily study) nearly 50 per cent, conditions being even worse among the girls, with over 60 per cent by the age of 12 to 16; that in the upper grades there is a marked increase of headaches, insomnia, and other nervous symptoms. It is a serious attack on the preposterous sys-

[1] L. M. Terman, 'Effects of School Life upon the Nutritive Processes,' *Pop. Sci. Monthly*, 1914. The English schoolboy has of late been elaborately studied at the Manchester Grammar School by Dr. A. Mumford (*Healthy Growth*, 1927) and found at the age of fifteen years to compare favourably in stature, weight, and chest circumference with his predecessor of forty years ago. But Mumford finds that the stress of organised mass examination still tends to retard chest development, in overwrought boys to become a nightmare, and to be a hindrance to individuality.

tem misleadingly called 'education' in civilised society, but Professor Terman probably realised that the vested interests of 'education' are so great that no disturbing changes will be made.

The sexual differences in the metabolic processes which we have already found are also indicated by an examination of the excreta; the best known and most important results concern the urine. The urine is the mirror of the activities of the whole organism, and in proportion as our methods of analysing it become more delicate we find in it a key to the whole organism. Not merely does the amount of liquid and of nitrogenous food largely influence the urine and its composition, but the kidneys are especially susceptible to a variety of influences; the nature of the food, of the salts it contains, the varying activities of the endocrine glands, emotional excitement, mental exertion, nervous tone, frequency of urination, the temperature of the air, are among the factors to be taken into account, and there is a compensatory relationship with the excreta by the skin. During the night we should expect these influences to cause less disturbance than during the day; and Beigel's observations seem to confirm this; he found that the amount of urine excreted during the night is almost equal in men and women, but that during the day there is a marked excess in men. Beaunis has found that, notwithstanding the disturbing elements, and independently of the water drunk, a regular diurnal rhythm may be traced in the excretion of urine.

A slight sexual difference appears soon after birth, both the solid and liquid constituents of the urine of the female infant being less. At from 3 to 7 years of age the amount of urine excreted by boys during 24 hours, according to Beaunis, is 750 c. cm., by girls 700 c. cm. This is 1½ times more than in the adult in proportion to body-weight. The amount of urea excreted by the child is even greater relatively than that of water, and the importance of this function of elimination in children is indicated by the

large size of their kidneys. At the age of eighteen the urine reaches the adult standard. The amount is, absolutely, usually rather smaller in women, but relatively it is usually greater. According to Beaunis, the amount is practically identical in both sexes, and therefore relatively greater in women. Becquerel and Rodier, as the result of a large number of experiments, came to the conclusion that the quantity of urine discharged by women during 24 hours is, even absolutely, slightly greater than in men. Mosler found (comparing men from the age of 18 to 21 with women of from 17 to 26) that while the absolute amount of urine was greater in men, in proportion to body-weight it was greater in women. It seems probable that, up to puberty at all events, the amount of urine excreted by girls tends to be absolutely greater than that excreted by boys; thus Kamerer found that the average volume of urine passed by girls aged 11 to 14 during 24 hours was greater than that passed by boys aged 15 to 16. English physiologists usually find the sexual difference rather considerable. French physiologists more frequently find the amount nearly equal, and thus relatively greater in women; this is probably due to differences in national habit and custom.

While the amount of water excreted by the kidneys in women is probably above what the difference in body-weight would lead us to expect, there seems little doubt that the amount of urinary solids excreted by women is both absolutely and relatively rather below that excreted by men; all physiologists are agreed on this point, and the fact is a more important index of metabolism than the relative amounts of water excreted. Children, in whom metabolism is active, excrete, relatively, considerably more urea and salts than adults; among adults the amount in women is relatively less than in men; in old age, when the metabolic processes of life are low, there is in both sexes a great diminution in the excretion of both solid and liquid constituents. The urine of women, like the blood of women, is more watery than that of men.

In women the influence of the menstrual cycle, which so largely affects the organism, has its effects here also. That the urine is frequently increased in amount at this period is a matter of common observation, and according to the usual rule this increase should involve an increase in the solids. This does not, however, appear to be always the case. Delaunay stated that menstruation diminished the urea 20 per cent, but without mentioning the extent of the data on which this opinion was founded. Beigel found lessening of urea during, and increase after, menstruation. Mary Jacobi made fourteen series of observations on six women, and found that in nine the urea was diminished during the flow, in five increased. But in the majority the urea during the menstrual period was more abundant than during the following week, when the lowest point was reached, and before the flow there was usually an increase of urea. Marro found by a series of observations on girls and young women that there was a gradual increase of urea in proportion to body-weight in the years preceding puberty, but that the establishment of menstruation produced not merely arrest but even diminution in the elimination of urea. He found that the urea was nearly always diminished during menstruation, slowly rising afterwards, and apparently reaching a maximum at the period most removed from menstruation.[1] A larger series of observations is, however, necessary to obtain definite results. Our knowledge of the influence of pregnancy and lactation on metabolic activity, as measured by the urine, is slight. Still Laulanié and Chambrelent noticed a marked diminution in the toxicity of the urine of pregnant women; especially towards the end of this period; in two experiments out of ten the urine of pregnant women was entirely free from the toxic substances present in normal urine, so that these appear to be retained towards the period of childbirth.

[1] Marro, *La Puberté*, 44. He believed (p. 241) that this diminution of urea at puberty, in association with the diminished output of carbonic acid, constitutes a state of lowered metabolism which is one of the physiological bases of hysteria.

SUSCEPTIBILITY TO POISON

There are various ways in which the varying effects of poisons on men and women might throw an interesting light on differences in metabolism and in nervous organisation. We know something of the special susceptibilities of children with regard to poisons, when given in small doses as drugs to produce beneficial effects, and also as to their effects on various animals, but not much is known as to sexual differences. These differences are usually of so slight a character that considerable precision of observation and a large body of cases are necessary to reach definite results. The poison which has most persistently been observed to exhibit sexual differences in its effects is alcohol; it is evident that this is simply because the effects of no other poison have been so widely studied. If medical men took the trouble to note systematically the effects of the drugs they administered we should be in possession of a considerable body of evidence; but they have rarely, if ever, done so on an extended scale.

From our present point of view, there are various questions which observation of the effect of drugs would help to elucidate. For example: (1) Do any drugs tend to produce greater effect on an organ in one sex than in the other? (2) Are there in one or the other sex examples of such marked susceptibility to a poison that the therapeutical doses must be decidedly smaller than considerations of size, etc., would lead us to anticipate? (3) Especially, are the higher nervous centres more apt to be affected in one sex than in the other?

(1) Observations on a large scale, or carefully recorded in their details, tending to prove or disprove any selective action of poisons on different organs in the two sexes are, so far as I am aware, very few. I have met with a paper, by Dr. F. Augustus Cox, containing a summary of the notes of over 1700 cases treated with arsenic which had been under his observation.[1] Some sexual differences in

[1] *Provincial Medical Journal*, Feb., 1891.

symptoms are noted, although it was not found that the influence of sex was marked in the evolution of unpleasant symptoms. Gastric symptoms were commoner in women, intestinal in men; conjunctival symptoms were met with rather oftener in the male sex; nervous symptoms were of more frequent occurrence in women. It may be added that, in Sir Jonathan Hutchinson's experience, children and the young bear arsenic well, while the old are susceptible to it, and it is specially apt to call out the signs of nerve degeneration whenever this is present.

Trousseau and Pidoux recorded some interesting observations on the varying action of opium on men and women. They found that in women it acts more on the skin, in men on the kidneys; they only observed hypersecretion of urine twice in women. They found also from observation on 22 men and 20 women that vomiting with opium, administered by the skin, or internally, was more frequent in women than in men. Lauder Brunton also stated that women, under the influence of opium, are more liable to nausea and also to headache.

Trousseau and Pidoux found that the administration of mercury more easily produces salivation in women than either in men or in children, who easily bear large doses.[1] This, also, was confirmed by Lauder Brunton.

(2) Men are said to bear the action of antimony much better than women; children bear it badly. Zuccarelli found in cases in which he treated epilepsy by injection of atropine that the benefit was much less in the case of women than of men; children also are very tolerant of belladonna, as is well established. Sulphonal, which is apt to produce nervous symptoms, should be given to women in much smaller doses than to men; Monod found that to produce the hypnotic effect a woman only required half the dose required by a man. On the other hand, in treating the insane with somnal, Umpfenbach found that women

[1] R. W. Parker has suggested that this is merely due to the large amount of milk taken by children, which may deprive the mercury of its irritant effects.

are much less susceptible to its influence than men. Germain Sée found that women are especially sensitive to antipyrin. Women are also said to be very readily affected by bromide (which affects the cerebral and especially the spinal system), while children (according to Voisin) bear it well, but (according to Radcliffe Crocker) bromide eruptions are most common in children.

It is remarkable that, as first noted by English authors, the overwhelming majority of deaths from chloroform are in males. The materials furnished by Sansom show that, according to various authorities, the proportion is at the highest estimate two men to one woman, and according to one estimate four men to one woman, although, as Sansom remarked, chloroform is so extensively used in childbirth. The Report of the Anæsthetics Committee of the British Medical Association (1901), founded on nearly 26,000 cases, showed that the percentage of complications under all anæsthetics together was in the ratio of about 1.5 males to 1 female, while the percentage of danger cases was still higher in males, being in the ratio of about 1.7 to 1. Under chloroform the danger-rate was found to be greater for males in the ratio of over 2 to 1. Under ether, indeed, the danger-rate was somewhat greater for females than for males, but minor complications were notably more frequent with males even under ether. Children, as the very large experience of the Moorfields Hospital shows, bear chloroform extremely well. The robust and healthy, according to Sansom, seem more exposed to the dangerous effects of chloroform than the delicate and weakly, and the largest relative number of fatal cases has occurred in very trifling surgical cases when the general health of the patient has been tolerably good.

Some allusion may here be made to the group of lead salts (which, according to Goetzke and others, primarily affect the central nervous system), as there is reason to believe that women are more susceptible to their action than men. Alderson in 1852 concluded that men are more

frequently affected, but Tanquerel found that women are more susceptible to lead-poisoning, and Sir T. Oliver of Newcastle, one of the chief centres of the lead industries, is decidedly of this opinion. In his Goulstonian Lectures on 'Lead-Poisoning,' he remarked that: 'There is no doubt in regard to the very much greater susceptibility of the female to be contaminated with lead compared to the male; and that this is not due simply to the fact of exposure in a lead factory to what may be regarded as the greater dangers, but depends upon sexual idiosyncrasy. Both as regards the acute and chronic forms of lead-poisoning, women are much more quickly brought under its influence than men. That this is not altogether a question of trade is shown by the fact that in an epidemic of lead-poisoning in Yorkshire, out of 1000 cases due to the drinking of water contaminated by the metal, the proportion of females to males was as four to one, though it may be urged that women probably drink more water than men. Not only is the female more susceptible, but she is so at an earlier age than the male, and is more likely to suffer severely, and from such nervous accidents as epilepsy. . . . One of the first noticeable effects of the pernicious influence of lead is the production of anæmia. Nearly all young women, those particularly between the ages of eighteen and twenty-four, when thus exposed suffer from deranged menstrual function; hæmatosis and ovarian activity are interfered with, and the result is either amenorrhœa or menorrhagia. Once the functional activity of the ovaries and blood-making is interfered with, that woman is already in a critical condition, and at any moment she may become the subject of explosive outbursts of plumbism. Lead as a poison strikes early at the functions of blood-making and reproduction, producing sterility, liability to abortion, and amenorrhœa, or menorrhagia. Woman, from her constitutional idiosyncrasy, is therefore more liable to be impressed by lead.' Bevan Lewis, in his 'Text-Book of Mental Diseases,' indirectly confirmed Sir T. Oliver by the vivid picture which he pre-

sents of the various nervous symptoms which are found among the young girls ('white-lead ghosts' they are called in the neighbourhood) who work in lead manufactories. These include arrest of sexual development with perverted instincts and unnatural desires, hysteria, chorea, epileptiform seizures, cataleptic states, and actual insanity. If we are justified in concluding that women suffer earlier and more severely from lead-poisoning, we may perhaps connect this with the less metabolic activity of women. In lead-poisoning there is marked metabolic deficiency. If this is so, we should expect to find that women are more susceptible than men to all those slow poisons of which lead is the subtle and terrible type. But the evidence before us is not convincingly presented.

(3) Women, as well as children, it is generally admitted, are very sensitive to the influence of opium. 'There can be little doubt,' Fonssagrives stated, 'as to the extreme impressionability of women to opium, and most of the cases of toxic saturation following the use of opium are in women.' Lauder Brunton makes a similar statement. Opium acts chiefly on the nervous system, but more especially on the brain. Children possess a greater proportion of nervous tissue and brain than adults, greater cell activity, and a greater power of absorption.[1] Therefore it is not surprising that children are susceptible to opium. The same is true of mammals generally. If poison is given to an adult rabbit and to a young rabbit, the poison in each case being proportionate to the animal's body-weight, the adult will be uninjured, the young one will succumb.[2] Among female animals generally, Cornevin states, there is greater sus-

[1] The greater rapidity of absorption in children has been well shown by Yatsuty, who selected healthy male subjects from eight years old to eighty, and experimented with iodide of potassium and salicylate of soda. The dose was made to depend on the body-weight, and the urine was examined every three minutes. The general result was that the younger the subject the more rapid the absorption. Thus while the salicylate was absorbed in boys and young men in about fifteen minutes, in middle-aged men it required about twenty minutes, and in old men about twenty-five minutes. (*Lancet*, 10 January, 1891.)

[2] Ch. Cornevin, *Des Plantes Vénéneuses* (Paris, 1887), 27–29.

ceptibility to poison, more especially nerve-poison, than among male animals; and in woman than in man. In cold-blooded animals like the frog, in which the cerebrum occupies a more subordinate position in relation to the spinal cord, opium causes tetanic convulsions, as it sometimes does also in children.

The best example of sexual selective action in the effect of a poison on the nervous system is, as already remarked, the case of alcohol. Alcoholism generally is much more common in men than in women; according to Hermann's figures, the proportion is 2800 men to 400 women; that is to say, women furnish one-seventh of the cases. Notwithstanding this considerable proportion of women, the cases in which the brain is chiefly affected, and which result in the symptoms of *delirium tremens*, occur almost exclusively in men. Rayer (according to Lancereaux) found among 170 cases of *delirium tremens* only 7 women; in Italy Verga found that 9 per cent of the cases were in women; at Copenhagen, Bang found only one woman in 456 cases; at the Charité in Berlin the proportion of cases in women is between 3 and 4 per cent; in England Clifford Allbutt had never seen *delirium tremens* in a woman. On the other hand, it is a familiar fact that chronic alcoholism tending to affect the spinal cord and nerves, and to result in muscular paralysis, is found chiefly in women. Lancereaux, who gave special attention to this matter, found that the ratio is twelve women to only three men. Broadbent and Clifford Allbutt made similar statements as regards England, and the fact may easily be confirmed in any large hospital. It is worth mention in the same connection that Ball in France found that sexual excitement, as a complication of dipsomania, is more frequent in women than in men.

This well-marked differential action of alcohol on the nervous centres in men and women is of some interest, and must be taken in connection with other facts referred to elsewhere.

There is comparatively little opportunity of studying

chronic alcoholism in children. Professor Demme, of Berne, where it is somewhat common among the poor in certain districts, found that the main symptom of alcoholic poisoning in children is abnormal excitement, ending, in extreme cases, in convulsions, and followed by mental and bodily debility of the nature of paralysis. There is here considerable resemblance to the symptoms of chronic alcoholic poisoning in women. It is also of some interest to observe that *delirium tremens* is an extremely rare result of alcoholism among lower races. Thus in American Negroes (as Reyburn showed from an analysis of over 400,000 Negro patients treated by the Medical Department of the American Bureau of Refugees) *delirium tremens* is of very rare occurrence, alcoholism being much more apt to lead to epileptiform convulsions or mania.

Of sexual differences in the action of tobacco we cannot speak so clearly as in the case of alcohol, perhaps because, unlike many other poisons, nicotine tends to affect impartially the whole organism. There is need of much more extended precise observation of the effect of tobacco than we possess at present, and the question has become important in consequence of the vastly increased use of tobacco during recent years. This increase is noted in nearly all countries; it seems to be specially pronounced in the United States of America, where the consumption of cigarettes rose, for instance, from 3000 million in 1914 to 52,000 million in 1921, and the consumption of tobacco per head is nearly double that of Great Britain.

Jean Nicot, the French Ambassador in Lisbon, from whom nicotine received its name, grew tobacco in his garden and vaunted its properties as a cure for many ills. It has turned out that nicotine is, in the words of Dixon, a cautious authority on pharmacology, 'one of the most fatal and rapid poisons known; it acts as quickly as prussic acid, and two drops put on the tongue of a dog will kill it almost immediately. The nicotine present in one cigar, if injected intravenously, would represent two fatal doses to

man.' Even when placed next to the skin for smuggling purposes, tobacco leaves have proved fatal. It is indeed remarkable that ordinary smoking so seldom produces immediately dangerous effects. We know that tobacco has a stimulating and then rapidly depressing action, and that, while in moderation often beneficial, it frequently has many minor disturbing effects, with at least one that is serious, by injuring eyesight; but Dixon concludes that how far it slowly conduces to degenerative changes in the organism we do not yet definitely know.[1]

Now that tobacco smoking is tending to become almost as common among women as among men, it is desirable to know if it has any specific effects on women. So far as it has, these are in the first place beneficial by soothing irritability and reducing excitement, including sexual excitement, for the energy of women is more apt to overflow into sexual channels than is usually that of men; and on these accounts women are frequently tempted to smoke beyond moderation. The poisonous effects on women of tobacco in excess are most likely to be observed in tobacco factories, where the employees are frequently young women. This matter has been investigated by Rosenfeld in Vienna, Max Hirsch in Berlin, and Gerd Unbehaun in Hesse, where there are large tobacco factories, chiefly employing young women. Sexual disorders have been found to be much more frequent among tobacco workers than among women in other forms of industry. Rosenfeld found anomalies of menstruation twice as frequent. Sometimes the menstrual cycle is prolonged, sometimes shortened. Painful menstruation also becomes frequent. Unbehaun found similar conditions in Hesse. It was not, however, observed that pregnancy ran any different course in tobacco workers as compared with women in other fields of industry. But there is reason to believe that nicotine has a degenerative effect on the ovaries; this has been found experimentally in animals, and Unbehaun observed it among

[1] W. E. Dixon, 'The Tobacco Habit,' *Brit. Med. Jour.*, 22 Oct., 1927.

women who were excessive cigarette-smokers.[1] These results do not affect the harmless and even beneficial effects on women of the moderate use of tobacco; but it is necessary to be cautious in the employment of so potent a poison.

HAIR AND PIGMENTATION

The growth of the hair, its colouring, and that of the body generally, have an intimate connection with the metabolic activity of the organism. Long ago Giard and Armand Gautier thought that it is possible to regard animal pigments as excretions, the results of metabolic activity. We now know that the hair and the skin and their characteristics respond sensitively to the ovaries, the thyroid, the adrenals, and the other hormonopoietic glands. It is thus that they come to play such distinctive parts in the male and the female sex-complexes. Even the endless varieties of disorders of the skin present a different system for each sex: there is one long list of skin disorders which predominate in men and another long list of those predominating in women.

Hair and more especially pigmentation play a part of the first importance as secondary sexual characters. Among animals generally, in a very obvious manner, brilliant pigmentation and abundant hair usually predominate among the males. But in Man pigmentation has become rudimentary and comparatively stable, while sexual hair distribution is fairly equalised. It is true that men have a growth of hair on the face,[2] but, on the other hand,

[1] Gerd Unbehaun, *Arch. f. Frauenkunde* (1928), Heft IV.

[2] The hair on the face in men is one of the most pronounced secondary sexual characters. There is some interest in remarking that the special prevalence of acne (or of pimples not amounting to acne) in young male adults has also been regarded as a secondary sexual character, since it is rare in women. As Woods Hutchinson points out (*Studies in Human Comparative Pathology*, 180), acne is a disease of the so-called sebaceous glands, which are immature or aborted hair follicles, and it is impossible not to connect the occurrence of acne, which usually appears at adolescence, with the normal impulse of the growth of hair on the face at this time.

women have a more vigorous growth of hair on their heads; even among races like the Singhalese, who preserve their hair long, that of the women is longer than that of the men, and, according to Pfaff and Waldeyer, the individual hairs are in Germany thicker in women than in men. Even among children (as Waldeyer points out) boys' hair, if left uncut, does not grow to the length of girls', though, according to Friedenthal, this rule fails to apply to European children, among whom up to the age of sixteen the hair of boys, if left uncut, is as long as that of girls,[1] and in some other parts of the world — India, China, the Pacific — there is sometimes little or no sexual difference in the length of the head-hair.

Women do not tend to become bald, either in Europe or among lower races like the Nicobarese, and do not suffer so often as men from *alopecia areata*. Again, white men, in Europe and wherever there is any sexual difference, have a more extended growth of hair on the body generally, while the more concentrated hair regions of women tend to be more vigorously developed; thus on the pubes it is frequently greater in amount in women than in men, and the individual hairs in this region are also (as both Pfaff and Waldeyer have found) of greater size than those of men. The sexual differences are therefore on the whole compensatory. In boys, it is stated by Godin, the pubic hair begins to appear, on the average, somewhat before puberty, while the axillary hair corresponds with puberty. In girls, according to Marthe Francillon, the pubic hair is slightly later than the first menstruation.

It must be added, however, that a real sexual distinction, and one of some interest, lies in the greater persistence in women of the fœtal *lanugo* or down. On their faces, necks, and bodies generally women retain this infantile character-

[1] The average length of the hair in women is usually stated to be between 60 and 75 cm., but a considerably greater length is frequently attained; thus in Munich, Stratz found a lady, 164 cm. (about 5 ft. 5 in.) in height, whose hair was 155 cm. (5 ft. 1 in.) in length, and he has also met four other women with notably beautiful hair which varied between 120 and 153 cm. in length.

istic of down to a much greater extent than men, and in some cases its presence is very marked. Friedenthal associates the greater abundance of down on women's bodies with their sensitiveness to touch, and assigns to it a function in maternal and erotic respects.[1]

There is, however, one question which, as we shall see, has a certain definite significance, and to which it seems possible to give a guarded answer: Are women darker than men?

There is no doubt that children have fairer hair and fairer skins than adults in various parts of the world, such as South America, Japan, New Guinea. Among many different races, also, travellers have recorded that the women are fairer than the men; among the more southern tribes of Central Australia, especially the Aruntas, Spencer and Gillen found the women slightly lighter in colour than the men, though this was not noticeable among the northern tribes. D'Albertis found that Papuan women in New Guinea are always lighter-coloured than the men; the Ainu women are also said to be fairer than the men, while among the Veddahs (as Deschamps noted) the women are not fairer than the men, though the children are fair. Among the Fuegians, Hyades and Deniker remark that the skin colour is lighter in women than in men, though before puberty darker in the girls. Among many African peoples the women are less black, though both sexes alike are exposed to the sun, and Mantegazza made the same observation regarding the Todas in India. But this tendency does not hold for fairer races. Thus among a large number of Jews and Jewesses in America Fishberg found the women darker in colour.[2] The determination of sexual difference in skin-colour is not, however, satisfactory, nor can we be

[1] A discussion of the characteristics of the hair and its distribution will be found in Hans Friedenthal, *Beiträge zur Naturgeschichte des Menschen*, Part III.

[2] *Am. Anthropologist* (1903), 92. In *The Jews* (Contemporary Science Series), 66, Fishberg states that among over 4000 Jews in New York, 53 per cent of the men and 57 per cent of the women belonged to the brunette type; the proportion of blond type was the same in both sexes, the difference being made up by a greater number of individuals of mixed types among the men.

sure that both sexes receive the same amount of exposure to the sun.

It is of more interest to investigate the colour of the hair and eyes. Alphonse de Candolle stated as a general proposition that the women in a population have a larger proportion of brown eyes than the men, but without bringing forward any definite evidence on the point.[1] In recent years, however, various investigators have occupied themselves with this matter. The question was studied in England in the first place by Beddoe. So far as the evidence goes, it appears that among children (in industrial and workhouse schools), girls with light eyes and light hair (and also girls with light eyes and red hair) are much commoner than boys; this applies to nearly all ages between six and fifteen. Boys having dark eyes and dark hair are on the whole commoner than girls.[2] The darkening of the hair was found by Beddoe to take place in men most markedly between the ages of twenty to twenty-three; but in women somewhat earlier.[3] This accords with what we already know as to the greater precocity of women. It is possible that the pigmentary process, being earlier established in women, becomes in them more intense. I was indebted to Dr. Beddoe for a series of figures showing the sexual differences in various parts of Great Britain; in his 'Races of Britain' they are given without regard to sex. Beddoe recognised the fallacies that may arise from differences in the mode of dressing the hair and from cosmetics, and also by a possible difference in the mean ages of men and women. From an examination of his table it appears that women have darker hair than men in Comrie (Perthshire), Thirsk, Boston, Leicester, Worcester, Norwich, and Southampton, while men have darker hair in Forteviot (Perthshire), Stoke-on-Trent, Shrewsbury, Hereford, and North Wales. It can scarcely be said that this particular list

[1] *Rev. d'Anth.* (1887), 265.

[2] *Report of Anthropometric Committee of British Association*, 1883.

[3] *Ibid.*, 1880.

strongly supports Beddoe's opinion as to the prevalence of dark pigment among women. The evidence furnished by the eyes is clearer. Dark eyes were almost constantly more numerous in women than in men, this being found at Forteviot, Comrie, Thirsk, Boston, Leicester, Shrewsbury, Hereford, Worcester, London, Southampton, and North Wales; only Ipswich showed men to possess darker eyes, while Stoke-on-Trent and Norwich showed the sexes to be equal. Beddoe regarded these results as fairly representing the facts as they would emerge from a more extensive investigation of his materials, and it illustrates his general conclusion: 'I have usually found a decidedly larger proportion of dark eyes among the women, but not so often of dark hair.' He regarded brown hair and brown eyes as chiefly common among women, black hair and grey eyes as more prevalent among men. An independent investigation of the members of the British Association during the Bath meeting, at a laboratory established for the occasion, confirmed Beddoe's results as regards eye-colour; while the eyes of medium colour were about equal in the sexes, 44.6 per cent of the men possessed light eyes, against only 34.2 per cent of the women, while 20.7 per cent of the women possessed dark eyes, against only 12.3 per cent of the men. At the Newcastle meeting it was found that a larger percentage of the men had light hair and light eyes, a slightly larger percentage of the men showed light eyes and dark hair, and a considerably larger percentage of the women possessed dark eyes and dark hair; this result in a part of the country of very different ethnological character from Bath (and 50 per cent of those examined at Newcastle were natives of Newcastle) also confirms Dr. Beddoe's results.

Professor Haddon and Dr. Browne have investigated the hair and eyes of over 400 inhabitants of the Aran Islands, on the west coast of Ireland. They adopted Beddoe's methods, and confirmed his results as to sexual differences. Both dark eyes and dark hair were found more prevalent

among females than among males, the results being more symmetrical as regards the eyes than as regards the hair.[1]

In Wales, Fleure and James have found that women are darker than men, 44.5 per cent women with dark hair and eyes, as against 40.1 per cent men; and in nearly all light-haired and light-eyed groups the men predominated. Fleure and James also note that pigmentation is especially marked among broad-headed women. They believe that there is a tendency to a more pronounced or more complete inheritance of pigmentation of hair and eyes in women.[2] We have to bear in mind, however, that what is fundamentally inherited is the special feminine pattern of the hormonopoietic glands, some of which are in women more or less recessive, and since these glands are specially concerned with the epidermis and its appendages, we might very well expect to find a sexual difference in degree of pigmentation.

In a private letter Dr. Beddoe made some interesting remarks on sexual differences in pigmentation, and raised the question of their causes: 'It is especially on the Welsh border [i.e., for example, Hereford and Shrewsbury] that the men come out with darker hair. That may have been due to the presence of more Welsh-bred men than women. I think the excess of dark women is most marked in the most purely Anglian (or, say, Teutonic) districts, such as Boston. Do the women still repeat the colours of their ancestresses, the British women who espoused the Saxon invaders? Possibly; no doubt there was intermarriage of that sort, though as the Saxons brought their cows over, I don't doubt that they brought a good many women too. Do the women deposit more pigment in their irides and hair because they have no beards wherein to expend it?' The latter supposition may seem to find support in the fact

[1] A. C. Haddon and C. R. Browne, *Proc. Roy. Irish Acad.* (1893), 782–86. In a later investigation in Galway (*ibid.* (1899), 228) Browne found the index of nigrescence higher in girls than in boys, and much higher in women than in men.

[2] Fleure and James, *Jour. Anth. Inst.*, XLVI (1916), 49.

that the darkening in women occurs at about the time at which the beard begins to grow in men; but we must remember that in amount of hair there does not seem any marked sexual inequality on the whole. With regard to Beddoe's suggestion as to the greater darkness of women being a sex-linked character, the same suggestion was also later made by Lenz, who considered that darkness might be of Mongoloid inheritance. In the Faroe Islands, where there was a large ancient Norwegian invasion, Sören Hansen found that the women are somewhat darker than the men, both as regards hair and eyes.

An elaborate later investigation in Great Britain is that of Gray and Tocher in East Aberdeenshire. These observers noted the eye and hair colour of over 14,000 children, and found that in percentage of dark hair the sexes were about equal, while as regards eye-colour the girls show a small (3 per cent) excess of dark eyes. In a further still more elaborate survey for the whole of Scotland, the results of which were presented in a special 'Memoir on the Pigmentation Survey of Scotland,' by John Gray, published by the Anthropological Institute in 1908, the results were found to vary in different parts of the country among the very large number of school children examined, and in some the girls were fairer-haired than the boys, while on the whole the percentage of light-eyed girls was the same as that of boys. It is suggested that where fair-haired boys predominate there were extensive early invasions of Norsemen, unaccompanied by women, and that where the fair-haired girls predominate the invaders were accompanied by their women. Among several thousand adults, however, the greater darkness of the women was clearly marked; the women had 11 per cent more dark hair than the men, and 16½ per cent more dark eyes.[1]

[1] J. Gray and J. F. Tocher, *Jour. Anth. Inst.*, January–June, 1900. Karl Pearson and Alice Lee confirmed the conclusion that the eyes of women are darker than those of men, *Proc. Roy. Soc.*, LXVI (1900), 324. J. F. Tocher published a monograph on the Pigmentation Survey of School Children in Scotland in *Biometrika*, Sept., 1908.

In Germany this question was fully studied by Pfitzner who, at the Anatomical Institute at Strassburg, found that fair men are always to a marked degree in excess of fair women, and the difference was clear even in early childhood.[1] Pfitzner endeavoured to find an explanation in the possibility of the sexes reaching the Institute in different racial mixtures. This is not impossible, but, as was pointed out in the first edition of the present book, this sexual difference is international, and has been observed among the living as well as among the dead. The same differences exist in Denmark. In that country Waldemar Schmidt (as Beddoe informed me) found more fair-haired and fewer dark-haired among the men than among the women, red hair being about equal, or rather less in the men. The eyes also in men are far more often light; there are fewer of medium colour, and immensely fewer are dark. The great majority of the men have light eyes and medium hair, while among the women fair, medium, and dark hair are about equally common, and about one-half have medium hair, and one-third dark hair. Among Danish school children Sören Hansen found that from the age of six to fourteen the proportion of light-haired boys is greater than of girls, but that the difference was less at the later age, that is to say the girls are growing darker to a greater extent than the boys. The differences in eye-colour are similar but less marked. Black hair, though rare in either sex, is throughout more frequently found in girls.[2]

In consequence of this criticism Pfitzner took up the matter again and investigated it in an exhaustive manner, eliminating so far as possible any fallacies, on the wider basis of over 2000 subjects of all ages. The result proved that among the native population of Lower Alsace females really are at all ages distinctly darker than males, both as regards eye-colour and hair-colour. Dark eyes were found to be 6 to 7 per cent more numerous in the females; or, ac-

[1] Schwalbe's *Morphologische Arbeiten*, II (1892).
[2] *Zt. f. Anth.* (1910), Heft 3, p. 144.

cording to Pfitzner's final results, there are 7 per cent more fair-haired individuals among males than among females, and 3 per cent more brown-eyed individuals among females. This greater pigmentation of the female sex Pfitzner regarded as a specific sexual character.[1]

Elkind examined men and women working in the factories of Warsaw, all being Poles belonging to the city, and found three types — a fair, a dark, and a mixed; only 17 per cent of the men belonged to the dark type, but 25 per cent of the women; this greater prevalence of the dark type among the women was at the expense of the mixed, the fair being equal. All authorities agree that Jewesses are darker-eyed than Jews, and most find them also darker-haired, but not Elkind and Fishberg.[2] Among a large number of Bulgarian school children, both in Bulgaria and in Turkey, between the age of six and twenty, Wateff found that the dark type prevails among the girls to a slightly greater extent than among the boys, the blond type being equal in both, so that, as in Poland, there was a deficiency of the mixed type among the girls. Considering eyes and hair separately, the girls had more dark eyes, but the boys more light hair. Prince Wiazemsky, however, among the Slavs generally (Russians, Servians, Bulgarians) found that fair hair prevails among the girls and dark hair among the boys, while as regards light eyes, there were no sex differences.[3]

We thus see that, though among children this distinction is less marked, or non-existent, women have darker hair than men, and decidedly darker eyes. We seem to be justified in concluding that this holds generally good for the fairer races of Northern Europe.[4]

Among the darker extra-European races, observations have only been made on a small scale, and do not always

[1] W. Pfitzner, *Morphologische Arbeiten*, Bd. VII, Heft 2, 1897; *ibid.*, *Zt. f. Morph.*, Bd. III, Heft 3, 1901.

[2] *Am. Anthropologist* (1903), 95. [3] *Bull. Soc. d'Anth. Paris* (1909), 275.

[4] Ripley, *The Races of Europe*, 322, 357, etc.

point in the same direction. Chantre found the women darker among the Armenians to a very decided extent; there were 51 per cent dark-haired men to 71 per cent dark-haired women, and 51 per cent dark-eyed men to 77 per cent dark-eyed women (darkness of the eyes being thus, as usually in Europe, even more marked in women than darkness of the hair); as regards the light-haired, there were 12 per cent men against 3 per cent women, and as regards light-eyed, 12 per cent men and no women. Among Tartars he found 63 per cent dark-haired men to 78 per cent dark-haired women, and 56 per cent dark-eyed men to 72 per cent dark-eyed women. Among the Kurds the sexes were equal as regards dark hair, but as regards dark eyes there were 66 per cent men to 80 per cent women. Among the Lapps Mantegazza and Sommier found that about 50 per cent of the women, and only about 30 per cent of the men, had brown eyes, but there was no similar preponderance of dark hair among the women. Among the Japanese (according to Collignon) sexual differences in the colour of the hair and eyes are slight, the women being a little less dark. Among the Fuegians, according to Hyades and Deniker, there is a larger proportion of dark eyes among the men, but the hair is exclusively dark among the women, and only predominantly dark among the men.

It is often stated that the fair in a population tend to die out, being more unprotected and more liable to succumb to various diseases and to severe climatic conditions. It is probable that there is in some countries good evidence of this tendency, and it may well be specially marked when a white race is transferred to a new and hotter country as in Australia, from which some evidence is forthcoming to this effect. In Great Britain, however, a leading authority, Professor F. G. Parsons, has stated (in Anthropology Section of the British Association in 1927) that his study of the hair and eyes leads him to believe that the Englishman's colour is perhaps becoming lighter and not darker

as is commonly supposed. Comparing his own statistics, covering some thousands of cases, with Beddoe's of some seventy years earlier, he is struck by what seems an increase of fairness, both in hair-colour and eye-colour. It is possible that the improved health conditions, which are increasing the height of the English people and diminishing the death-rate, specially benefit the fair.

CHAPTER IV

THE VISCERA

The psychological significance of the viscera — The thyroid gland and its function in metabolism — Its physiological and pathological variations in women — Exophthalmic goitre — The larynx and the voice — Changes at puberty — Relation of the voice to the sexual organs — The thoracic viscera — Heart — Lungs — The abdominal viscera — Stomach — Digestion — Frequency of disorders of intestinal tract — Liver — Spleen — Kidneys — Bladder — The viscera a factor in the production of emotional states.

We have seen how the metabolism of the body is largely controlled by the chief hormonopoietic glands, tending to produce and maintain a definite masculine or feminine pattern. If now we attempt to examine the internal organs a little more systematically, we must not be surprised if we find — as the growth of physiological knowledge continues to make clearer — that we are still exploring the same field and still largely concerned with the subtle influence of the internal messengers moulding the body into a masculine or feminine shape and preparing each sex to play its special part in the world. At every point we realise that just as anthropology is founded on anatomy, so psychology is founded on physiology. When we say that the suprarenal capsule is a ganglionic body moulded on to the top of the kidney, we assert an anatomical fact; when we go on to say that the suprarenal capsule is larger in women than in men, and very large in Negroes, we assert an anthropological fact. In the same way, when we accurately estimate or graphically represent the ordinary action of the heart or the pulse, we are well within the region of physiology. But when we begin to make the same observations on the heart and pulse under varying conditions, internal and external, of the individual organism, we are not far from the region of psychology and are indeed already drawing near to sociology. In the light of the dawn-

ing knowledge of to-day we begin to see that no one now can be a competent psychologist who is not something of a physiologist, just as no one can be a competent physiologist who is not something of a chemist and a physicist. The physiology of the senses has led to the psychology of intellect, and the physiology of the viscera leads us to the psychology of emotion. If we possessed, for instance, a thorough physiological knowledge of the thyroid gland, we should probably know more of the nature of emotion than all mere introspection, or mere general picturesque description, has ever taught us.

THE THYROID GLAND

This subtly potent gland of the neck is intimately connected with the metabolism and development of the body and the functioning of the nervous system. It is, moreover, closely associated with the sexual system, especially in women. It may indeed be said that of all the organs common to both sexes the thyroid gland stands out as possessing a special and peculiar significance in the physiological and even the psychic life of women. It has been termed the gland of emotion.

As we know, the specific qualities of femininity are not entirely dependent, as was once supposed, on the ovaries. They are dependent on the harmonious balance of a number of internal secretions. Among these must be placed high in importance the secretion of the thyroid. The thyroid may be said to take a leading part in directing the metabolism of the whole body in accordance with the needs of the generative system. With thyroid insufficiency there may be some arrest of genital development, delayed puberty, disorders of menstruation, a tendency to atrophy of uterus, defective sexual impulse, and general mental apathy. In such cases the feeding of the patient with thyroid gland has been found to produce an entire change of temperament; the girl who was dull, fat, heavy, depressed, always tired, drowsy and inattentive, becomes

active, bright-eyed, joyous, interested in her work.[1] The thyroid gland is also liable to be affected in insanity and tends to be enlarged or otherwise changed in the emotional forms of insanity.

The thyroid is thus intimately connected, not only with the genital life, but with the psychic life of women. It may be added that the fact that in women of high intellectual ability the sexual impulses are often strongly developed may find a plausible explanation in the stimulating influence of the thyroid, alike in the sexual and the psychic spheres.

It is generally agreed that as a rule the thyroid gland is absolutely larger in women than in men, and that relatively it is very large in childhood. While in the new-born child its proportion to the weight of the body is as 1 to 400, or even to 420, in the adult it is only 1 to 1800. In old age the thyroid is considerably diminished in size, and while total extirpation of the thyroid is not then likely to be followed by serious results, before puberty it will almost certainly be followed by serious injury to health.

An interesting anthropometrical study of the relation between the size of the thyroid and the physical and mental development in adolescence has been made by P. Stocks and A. V. Stocks, the maximum breadth being found a reliable guide to the size. In the absence of goitre, the gland hardly changes between the ages of 10½ and 13½, this flattening of the growth curve just before puberty being regarded by the Stocks as unique. In girls a rapid development of the gland occurs between 13½ and 15, doubtless associated with the onset of menstruation. In boys no evidence was found of any relation between the size of the thyroid and physical development, size of head,

[1] The thyroid is termed 'the gland of creation' by Crichton Millar (*Brit. Med. Jour.*, 23 Sept., 1922), from its importance not only in procreation but, also, as he believes in the wide sense of artistic creation; people with inferior development of the thyroid cannot create either children or art. Millar holds that child-bearing and artistic creation are mutually exclusive because woman's thyroidal storehouse of energy cannot cope with both at the same time.

rate of growth, or strength of grip. But in girls there was a significant positive association with the height and weight, the rate of growth, the grip, the heart pressure, though not with pulse pressure and rate, or with school proficiency.[1]

The thyroid gland is thus closely associated with all the variations in a woman's organism. So marked is this that Meckel long ago remarked that the thyroid is a repetition of the uterus in the neck. We now associate it more especially with the ovaries, to which it is most closely associated, and, as Blair Bell and others have shown, supplementary. The fact that the neck swells in women in harmony with the sexual organs seems to have been an observation made in very early times. All sexual activity in women is accompanied or preceded by hyper-activity of the thyroid. It swells at the first menstruation, and not uncommonly increases at every menstruation; at its final suppression also the thyroid may swell, while enlargement of the thyroid may be an accompaniment of uterine disorder. There is always a tendency, though it is not invariable, for menstruation to be affected in disorder of the thyroid, the influence usually being, as Gardiner-Hill and Forest Smith have lately shown, inverse, excess of thyroid activity leading to diminished menstruation, and defect of thyroid activity to increased menstruation. In the dog, cat, sheep, goat, and deer it has also been observed that the thyroid enlarges during heat or rut. Catullus refers to the influence of the first sexual intercourse in causing swelling of the neck, and it was an ancient custom to measure the necks of newly-married women in order to ascertain their virginity, a custom not yet quite dead in the south of France. Heidenreich found that a similar swelling occurs in men at the commencement of sexual relations. Democritus referred to the swelling of the neck during pregnancy, and Freund finds that congestion of the thyroid is almost constant during pregnancy (in forty-five out of fifty cases), and further, that it increases in volume at the

[1] P. Stocks and A. V. Stocks, *Biometrika*, Dec., 1927.

birth of the child, and sometimes also continues in this condition during lactation. In rare cases there is visible and obvious swelling of the thyroid in association with emotional states, even in men.

Nearly all the diseases of the thyroid gland are more frequent in women than in men. Goitre — or simple enlargement of the gland — is decidedly more common in women; the proportion varies in different localities from one man to two women, to one man to fifteen women.[1] Cretinism — or idiocy resulting from disease of the thyroid gland — appears to be usually rather more common in males, but it is stated that in England sporadic cretinism is more common in females. Myxœdema — a closely allied physical and mental disorder dependent on degenerative disease of the thyroid — is chiefly found in middle-aged women. Exophthalmic goitre (Graves's disease or Basedow's disease) is a somewhat more complicated disorder, but primarily an affection of the thyroid gland. Its symptoms present a picture which is the reverse of that presented in myxœdema, and are associated with excess of thyroid secretion, as myxœdema is with defect. There is great rapidity of heart action, restlessness, nervousness, irritability, apprehension, subdued excitement. All authorities are agreed that it is more common in women than in men. Hector MacKenzie in England finds five women to one man; G. R. Murray, also in England, finds seventeen women to one man; Kurt Mendel, taking a wide survey of the literature, concludes that the real sexual proportion is 9.3 women to one man. Clifford Allbutt has

[1] This special prevalence of goitre among women is not merely found in the Pennine valleys in England and in the other parts of Europe where it is endemic, but, it would seem, in nearly all parts of the world where the disease is found. Thus Munson, who made a collective investigation concerning goitre among American Indians, found that fully 80 per cent of the cases occurred in females, the disease tending to appear at puberty; when found in men it was much less serious. From Kafiristan, in the north of India, the same report is made. 'Goitre,' Sir G. S. Robertson writes in *The Kafirs of the Hindu-Kush*, 'is almost exclusively confined to women; Bashgul men and women live under the same conditions of life, drink from the same streams, and eat more or less the same kind of food'; yet the women alone are affected.

said: 'Every woman stands often at the gate of Graves's disease.'

Exophthalmic goitre has been described by McCarrison, a leading authority on the subject, on this point in agreement with Eason, as 'a morbid product of modern life.' Whatever its ultimate cause may be — sometimes regarded as nutritional defect affecting metabolism — it is agreed that by far the most important exciting causes are those that operate through the emotional centres of the brain. Its manifestations are specially favoured by the presence in women during the active period of sexual life of light skeletal formation, 'with fine bones, narrow build, acute costal angle, small muscles, and poorly hung viscera.' Persons of this gracile type, under the stress of emotional disturbance, or prolonged strain, are specially liable to exophthalmic goitre, while persons of more masculine build escape.[1]

THE LARYNX AND THE VOICE

Something may here be said of the functions of the larynx, an organ in close proximity to the thyroid, although completely distinct.

In the lower human races generally the larynx is comparatively undeveloped, and the voice is usually inclined to be high and shrill. It is in Europe that both larynx and voice are most highly developed; nearly all great singers are of European race, and the European voice is the most sonorous; the Tartars are, however, said to possess the loudest and most powerful voices, the Germans coming next. Delaunay argued that the tendency of evolution is in the direction of the enlargement of the larynx and of the deepening of the voice.

Up to puberty the sexual differences in the larynx and in the voice are not marked, but at this epoch they become considerable. The boy's larynx enlarges to a greater degree than the girl's, while his voice 'breaks' and becomes deeper,

[1] J. Eason, *Exophthalmic Goitre* (1927).

a change which also occurs in girls but more slightly and less suddenly. The woman's larynx and voice retain more nearly the characteristics of the child's. While the growth of the male glottis at puberty is as 5 to 10, that of the female glottis is only as 5 to 7 (C. Langer).

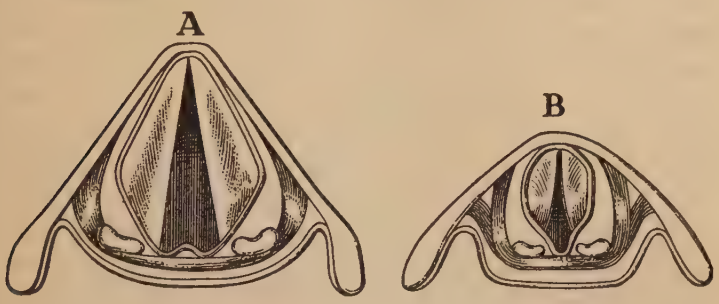
In castrated persons, however, the larynx remains puerile, although perhaps slightly larger than in women. The old Italian custom of castrating boys to preserve their youthful singing voices bears witness to the close connection between the voice and the organs of sex. Delaunay remarks that while a bass need not fear any kind of sexual or other excess so far as his voice is concerned, a tenor must be extremely careful and temperate. Among prostitutes, it may be added, the voice and larynx often tend to take a masculine direction. This has been investigated at Genoa by Masini, who finds that among fifty prostitutes twenty-nine showed in a high degree the deep masculine voice, while the larynx was large and the vocal cords resembled those of man; only six out of the fifty showed a normal larynx; while of twenty presumably honest women only two showed the ample masculine larynx.[1]

The position of the larynx in adult normal women is somewhat higher in the neck than in men; in this, as well as in the character of the larynx generally, women approach children. In nearly every dimension man's larynx is larger, the entire male larynx being about one-third larger than the female. But while in the transverse diameter there is comparatively little sexual difference, in the antero-posterior diameter there is great difference. The vocal cords are considerably longer in men, the growth (according to Barth) between the ages of 14 and 30 being from 13 mm. to 30 mm. in males, and from 12 mm. to 20 mm. in females.[2]

[1] *Archivio di Psichiatria*, XIV, Fasc. 1–2, p. 145.

[2] A detailed account of the anatomical differences in the larynx will be found in the Art. 'Larynx' by Béclard, *Dict. ency. des Sci. Méd.*, 554–65; see also Professor K. Taguchi (of Tokio), *Archiv. für Anat. u. Phys.* (1889), Heft 5–6. The diagram on page 103 shows roughly the main difference between the typical male larynx and the typical female larynx.

The difference in voice is one of the most obvious of the human secondary sexual characters. The higher and shriller voice of woman, Delaunay remarks, seems to have determined the nature of the grammatical feminine end-



A. HORIZONTAL SECTION OF MALE GLOTTIS
B. FEMALE GLOTTIS (*Langer*)

ings of words, and the sharper quality of the feminine endings may be well studied in the French language. This sexual vocal difference is by no means peculiar to Man: in most animals the female has a shriller and weaker voice than the male, as the hen, bitch, and mare, for example; and Buffon observed that the she-ass has a clearer and more piercing voice than the male. Darwin, discussing the loud voices of male animals at the breeding season, came to the conclusion that the most probable view is that 'the frequent use of the voice, under the strong excitement of love, jealousy, and rage, continued during many generations, may at last have produced an inherited effect in the vocal organs.' [1] It is scarcely possible yet to speak definitely as to the cause of this secondary sexual character, or its utility. That the deeper voice of a man, and the gentler but higher-pitched voice in woman, have their effect in heightening the pleasure of the sexes in each other's person is well known.

[1] *Descent of Man*, Part II, chap. XVIII. This conclusion (which involves the inheritance of acquired characters) is not universally accepted.

Among the lower animals it is nearly always the males that are most vocal. This is not the case in the human species. Women are both readier and more accomplished than men in the use of the voice. Thus Monroe found in America that at all ages girls surpass boys in ability to sing the scale, and also, though to a less degree, in memory for tones.[1]

THE THORACIC VISCERA

The heart at an early age is as large in the female as in the male, or even larger. According to Boyd's tables, it is still absolutely larger in girls between the ages of fourteen and twenty, but from that age on it keeps about two ounces smaller; the maximum weight is only attained at a mature age. In Russia Falk found the heart larger in boys up to twelve years, and from then to fifteen larger in girls. According to F. W. Beneke, the child has a relatively large arterial system, but at puberty this relation is changed; 'the larger the heart relatively to the vessels the higher the blood pressure, and the earlier this becomes the case the earlier, stronger, and more complete is the development of puberty.'[2] According to Vierordt's tables, the male heart from birth onwards increases its original weight fully thirteen times, the female heart less than twelve times. Hypertrophy of the heart is about twice as common in men as in women, while atrophy is somewhat more frequent in women. It would appear probable that in man, as in mammals generally, there is no notable sexual difference in the relation of heart-weight to body-weight.[3]

The right lung, according to Boyd, is absolutely larger in the female child at birth, but between the ages of twenty and thirty the male lung has become by as much as a third of its weight heavier than the female.[4]

[1] W. Monroe, *Psych. Rev.* (March, 1903), 155.

[2] F. W. Beneke, *Die anat, Grundlagen der Constitutionsanomalien des Menschen* (Marburg, 1878).

[3] D. R. Joseph, *Jour. Experimental Med.*, July, 1908.

[4] Boyd's 'Table of Weights of the Human Body and Internal Organs,' founded on the results of 2600 postmortems, *Philosophical Transactions* (1861).

It is not easy to ascertain the normal weights of the lungs and heart, as these are so frequently increased or diminished through disease. It seems probable, however, that there is a tendency in early life for the heart and lungs in the female child to develop faster than in the male. If so, it may be another case of precocity resulting in diminished final attainment, for there is reason to think that in women these organs are relatively somewhat smaller than in men. This result is in harmony with what we know of the size of the thorax in women, and of their marked inferiority in vital capacity and in muscular efforts.

THE ABDOMINAL VISCERA

If we begin at the throat with the pharynx, we find that the tonsils are more liable to inflammation in females than in males, a fact noted as long ago as 1834, by Baumann. This special frequency is found in Germany at all age-periods but is greatest in the third decade. Females also appear to be more prone to hypertrophy of the tonsils and to adenoids. Anomalies of the salivary secretion are, however, more frequent in males, as also are organic diseases of the œsophagus.

The stomach appears to be relatively larger in women than in men. Thus, according to Boyd's tables, it is the same size in both sexes at birth; between the ages of fourteen and twenty it is still of equal size in both sexes, or indeed somewhat heavier in girls, although the total average weight of the boys is five pounds more than of the girls. At the age of twenty to thirty it is still nearly the same size in men and women, although the preponderance of men in total weight has by this time become much greater.

It is stated by Burdach and other old writers that the intestinal canal is longer in women than in men, and women are said by Burdach and others to digest more rapidly than men. Delaunay found on making inquiries from the matrons of orphan asylums that little girls become hungry much oftener than little boys, and he also

found that in almshouses for the aged where there are three regulation meals a day, the old women often put aside a portion of their meals to eat during the interval. The need for food at frequent intervals is common among the young.

At the same time women eat less than men. In prisons and hospitals, according to Burdach, women take nearly one-fifth less food than men. It would probably be easy to add proofs of the small appetite of women, but it must be added that when women work, are under good conditions, and not forced to economise, the sexual difference is by no means marked.

It has often been said that gluttony is more common in women than in men. Delaunay came to this conclusion as the unanimous result of his inquiries; he found it was most marked during menstruation and pregnancy. Brillat Savarin thought that women are inclined to be *gourmandes*, the reason being that they know it is favourable to beauty. I should be inclined to say that women are *friandes* rather than *gourmandes*, loving special foods, chiefly sweets, sometimes acids; such a conclusion is in accordance with the facts given by Delaunay. And it may be added that in so far as women are addicted as men are to the use of tobacco their *friandise* seems less observable. The taste for tobacco and the taste for sweets tend to be mutually exclusive.

If we consider the sexual incidence of disorders of the digestive tract, we find that in childhood functional affections of the stomach are specially frequent in males. The normal acidity of the gastric juice was found by Brunig to show no sexual difference in boys and girls up to the age of fifteen. In gastric disorders (excluding ulcer) men show a tendency to acid excess and women to acid deficiency. Gastric ulcer is about twice as common among females as among males, and is chiefly found between the ages of eighteen to twenty-two. When it appears in men it is not usually until after the age of thirty; but in men it is a much more serious disease than in young women in whom it tends to heal easily. It used to be found commonly asso-

ciated with anæmia and chlorosis in girls. Duodenal ulcer, on the other hand, is much commoner in males, even from an early age, though that also is liable to be more serious in men than in women, in whom indeed it may perhaps be so slight as not to cause recognisable symptoms. As regards the appendix, the mortality from appendicitis is higher among males at all age-periods and apparently in all parts of the world; according to some statistics, it is more than twice as fatal in males. It used formerly to be said that the disease is more liable to occur in males in the proportion of about four males to three females. Now this is more doubtful, and chronic appendicitis is even said to be more common in females. It has been suggested that appendicitis was formerly perhaps too rarely diagnosed in women, and now too frequently. Habitual constipation, there is no doubt, is predominant in women, usually beginning between the ages of fifteen to twenty, but intestinal obstruction is more common in men.[1]

The liver is relatively very large at birth, and according to Vierordt it is proportionately somewhat larger in women. Boyd's figures tend on the whole to show the same result. According to Gegenbaur, however, the liver represents 28 per cent of the weight of the body in men, and only 26 per cent in women. Wiesener's figures show that it varies very greatly through life, and at birth is larger in the female. On the whole, it is difficult to speak definitely regarding so variable an organ, but it seems probable that if there is any sexual difference at all it is in favour of women.

The spleen, according to Boyd's tables, is, on the average, absolutely larger in the female, if prematurely stillborn, if stillborn at full time, or if born alive. Up to three months it is the same size in both sexes, and after that it is of about equal size in both sexes proportionately to body-weight. The maximum weight of the spleen in proportion to the body, according to Gaston and Vallée, who have

[1] H. Gunther. *Archiv für Verdauungskrankheiten*, Feb. and April, 1927.

specially studied the organ, it may be mentioned, is attained at the age of eight; it is therefore essentially an organ of childhood. Blosfeld of Kasan and Gocke of Munich have both found the spleen (according to Vierordt) absolutely larger in women by about 12 grammes; Vierordt himself does not find much sexual difference. The functions of the spleen are not very clear, but it seems, like the liver, to play an important part in absorbing any poisons circulating in the blood.

The kidneys in infancy are relatively very large. In early life, according to Boyd's tables, they are in absolute figures slightly smaller in the female, the difference increasing in the adult. Sappey has found the average length, breadth, and thickness equal in the sexes, and therefore relatively greater in women. While the absolute weight is somewhat less in women, proportionately to body-weight there seems to be little sexual difference.

The bladder is relatively small in infancy, and its shape is at this time inclined to be fusiform; in men it is ovoid, and in women ellipsoid, or rounder. It is also relatively larger in women, with a tendency to lateral expansion, and more dilatable; the majority of cases of enormous distension of the bladder have been found in women. It may perhaps be said, therefore, that the bladder is more highly evolved in women than in men.

There has been considerable controversy as to the relative size of the male and female bladders. Cruveilhier stated that it is larger in women. Sappey, as well as Hoffmann, on the other hand, claims a vesical predominance for men, and concludes that when in women the viscus is large, it is simply due to unnatural habits of distension, the result of social causes. Charpy, who attributed much importance to sexual differences of size in the bladder, found that it was anatomically smaller in women, but of greater physiological capacity. Heitzmann and Winckel (who made a special study of the female bladder) find it larger in women. Hart and Barbour find that, relatively

to body-weight, it is more capacious in women. Duchastelet in the living subject found that the tolerance of the female bladder on injecting water is much greater than of the male. Genouville considers that habit may possibly have something to do with this greater dilatability of the bladder in women, but that it is certain that the female bladder is predisposed to this, and possesses a native dilatability. It is less heavy and muscular than that of men. The child's is even less dilatable than that of men. The anatomical capacity of the bladder (i.e., after death), Genouville concludes, with Charpy, is greater in men; during life the capacity is greater in women. The special frequency of urination in many women is a nervous rather than anatomical fact, for the threshold of the desire to urinate is not determined by the amount of urine, but by the nervous energy with which the bladder contracts on that amount.

On the whole, this glance at the viscera seems to show that the thoracic organs somewhat predominate in men and the abdominal in women. Our knowledge is imperfect and the fallacies are so considerable that we can scarcely hope to attain accurate information. Such results as we see, however, are in harmony with the differences in the thoracic and abdominal cavities. They are in harmony, also, with the opinions of the older writers, who attributed abdominal predominance to women. The muscular energy which is so marked a characteristic of men depends largely on the strength of the heart and lungs.

It is not possible to say much at present of the viscera as organs of emotion, although there is reason to believe that the organic basis of emotion is largely to be traced here. A very ancient and widespread psychology has placed the seat of the manly virtues of courage and endurance in the breast, and the womanly virtues of love and pity in the belly. Cœur-de-lion is emphatically a manly title of honour; the liver was formerly regarded as the organ of love, and the Hebrew and other races, even as far off as the Pacific, have found the seat of compassion in their bowels.

CHAPTER V

THE PERIODICITY OF WOMEN

The phenomena of menstruation — The theory that women are natural invalids — The cyclic life of women — Illustrated by the observation of various functions — The special physical and psychic phenomena of the monthly climax — These are intensified in ill-health — The improved hygiene of menstruation — The legal, scientific, and social significance of women's periodicity of function — The economic aspect — Women not suffering from any natural disability.

The fact that from puberty onwards during the years of sexual life, with periods of intermission caused when impregnation occurs, women are subjected to a monthly loss of blood has incidentally come before us several times. The amount of blood lost every lunar month may be said to be between 100 and 200 grammes; the period of flow lasts from three to five days, and on an average recurs on every twenty-eighth day; and the age at which it first appears is usually between 13 and 16, though it may be earlier or later. The sexual life, as determined by the occurrence of menstruation, lasts on an average in English women and those of allied race (according to Tilt and others) for a little over thirty years. In mid-European women, Kisch found that the duration of sexual life ranged from 6 years to 46 years; 32 years was the most frequent length and 30 years the average length. In Northern Germany, Krieger also found that 30 years is the average duration of sexual life. In French women it is about the same, in Austrian women a little less, and in Russian women a little more.[1] The menopause or change of life occurs in nearly 50 per cent of women between the ages of 44 and 51, in a small proportion at 40 and in a still smaller after 55.

Dr. Alice Clow finds in England that, while the age of onset of menstruation varies from 8 to 19 years, in school girls of good social class 13 is the most usual age, while at

[1] Kisch (*Sexual Life of Women*, part I) brings together many detailed statistics.

a Training College, where the girls come from humble though not necessitous homes, the most usual age is 14. The general standard of health was good in both classes of girls, but the school girls were on the whole of better physique. So that earlier generative development seems associated with physical fitness.[1]

Dr. Florence Willey, among hospital patients in London, found that over 75 per cent began to menstruate between the ages of 13 and 16, 44 per cent beginning at 14 or 15. Among German girls at Bonn, Metzger found that the most frequent age of first menstruation was 15 (in about 20 per cent), the range being from 8 years to 25; in both these extreme cases menstruation proving to be of regular type as soon as established. In Sweden, also, 15 is the most usual age of first menstruation (in 26 per cent cases), the second and third places being taken by the 14th and 16th years. Among Russians the usual age of menstruation, according to Weissenberg, is 14 years, and among Russian Jewesses, 13 to 14 years. In Italy it is said to be 14½.

So far as the North American Continent is concerned, the question has been thoroughly investigated by Engelmann, who succeeded in accumulating a vast amount of data. He found that while the average age of first menstruation in Europe is 15.5, in the American Continent it is 14, with a range from 13.5 in the case of girls of refinement and education to 14.5 in the case of American-born labouring-class girls of Irish and German parentage. Engelmann considered that in America climate has had practically no influence, race very little, mentality, surroundings, education, and nerve stimulation being the main factors of American precocity. It is curious that in this respect the American girl resembles the American Indian who matures at an earlier age than the girls of any other land in the temperate zone.[2]

[1] A. E. S. Clow, *Brit. Med. Jour.*, 10 Sept., 1927.

[2] G. J. Engelmann, 'The Age of First Menstruation,' *Trans. Am. Gynecological Soc.* (1901).

As regards the East, the question has been most thoroughly studied on a wide statistical basis in Japan. Of the various races in the Japanese Empire, it is found that menstruation begins in Japanese girls on the average at the age of 14 years and 10 months, in the Aino at 15 years, in the girls of the Loo-Choo Islands at 16 years, in the Chinese of Japan at 16 years and some months. Yamasaki, who brings forward these results, is unable to offer a satisfactory explanation of the differences. Weissenberg gives the normal age of menstruation in Chinese girls as 17 years. In Melanesia Reche found that girls menstruate at 17, and that at this age the secondary sexual characters develop and growth ceases.

There is some reason to believe that, though the inhabitants of hot countries do not necessarily menstruate earlier than those of temperate latitudes, Europeans in the East menstruate earlier than in Europe. Thus Max Glogner found that in 18 of 25 true European women, and all but 3 of 50 Europeans of mixed races, the function was established before the normal time for European women. In Calcutta, Leicester states that the onset of menstruation appears to be rather earlier among Europeans born and bred in India, than in those coming to the country at a later age, that it is later in the case of pure Europeans in India than in those of mixed races, and that the more the dark element preponderates, the earlier is the date of first menstruation. Kisch states that menstruation begins earlier in brunettes than in blondes.

Climate, race, habits of life, social position, the influence of towns, may all have an influence in modifying the age of menstruation. As far back as the days of the Talmud, it was recognised not only that girls reach puberty earlier than boys, but that town girls menstruate earlier than country girls.[1]

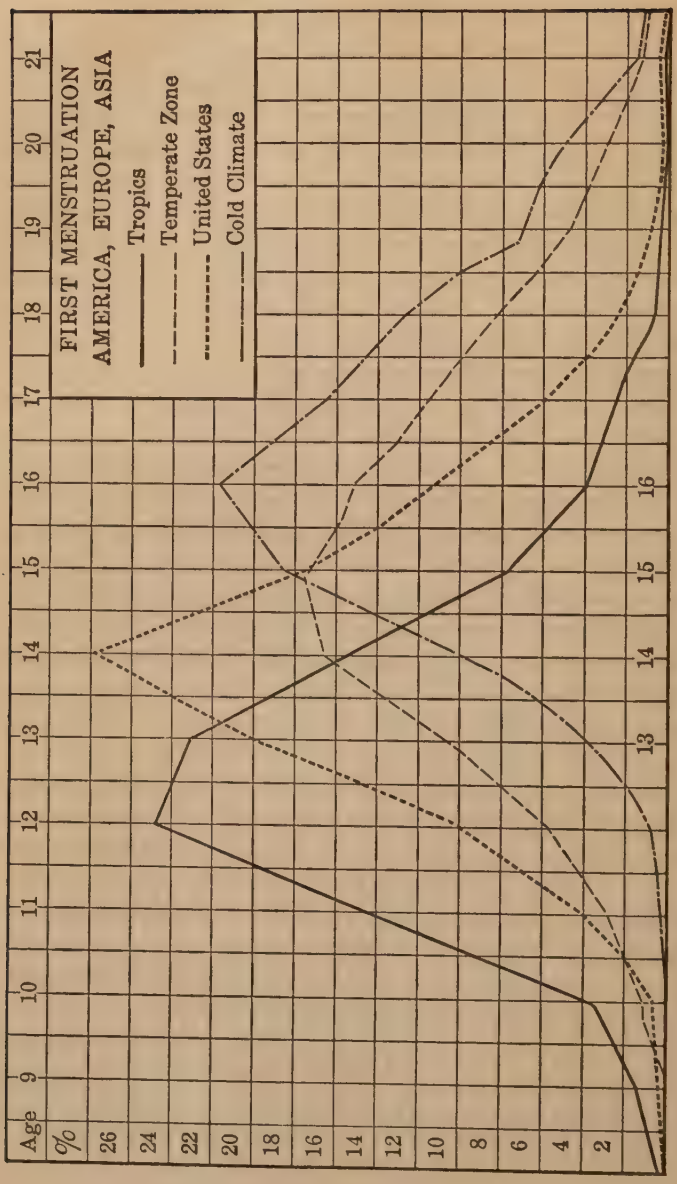
[1] Full details concerning the age of menstruation in different parts of the world, as well as a discussion of the conditions affecting its onset, may be found in Ploss's *Das Weib* (11th ed., 1927), Bd. I, 666–705.

In the past 'constitution' has been vaguely recognised as one of the factors determining the age of the onset of menstruation. But it is only during the last few years that it has been possible to introduce this factor more definitely. Even Kretschmer, on whose important work, 'Physique and Character' (first published in 1921), 'constitutionology' may be said to be largely based, had little or nothing to say of the relation of the various types he described to the onset of menstruation. Sserdjukov of Moscow, however, has given attention to this point and regards it as a recognised fact that in the asthenic and hypoplastic (which include infantile) types, menstruation is not easily established and is often delayed.[1] His own observations among 700 women show this condition among the asthenic, the infantile-asthenic, and especially the intersexual type. In this type 30 per cent are later than the age of 16, though in girls of pyknic type this happens in only 20 per cent, while he gives a table showing only 14 per cent pyknic girls beginning to menstruate after the age of 16, but 26 per cent of the infantile asthenic girls.[2] It is desirable that the approximative constitutional type should be mentioned when the age of a girl at first menstruation is noted, though at present the terminology is not as precise as could be wished.

Menstruation, in its essential elements, is not a process confined to the human species. It corresponds in essentials to the 'heat' or œstrum — more strictly the period of pre-œstrum — which we find in mammals generally. This has occasionally been denied, but those who deny it insist on differences which, while indispensable, are unessential. The best authorities are agreed that there is 'no doubt regarding the essential similarity between the menstrual

[1] For explanation of these types, see Kretschmer, *Physique and Character* (English translation), New York: Harcourt Brace, 1925. Reference may also be made to the great work of Halban and Seitz, *Biologie und Pathologie des Weibes* (1921), and especially to the essay by Mathes on the constitutional types of women. The terminology here used is somewhat different from Kretschmer's.

[2] Sserdjukov and Melnikov, *Arch. f. Frauenkunde*, Bd. XIV, Heft 4 (1928).



AGE OF FIRST MENSTRUATION IN 57,000 CASES (*Engelmann*)

cycle in the Primates and the œstrous cycle in the lower Mammalia.'[1] We can come to no other conclusion when we observe the evolution of the one process into the other in the mammalian series; in some of the monkeys we find the point of transition, for they menstruate like women, while in some respects their reproductive cycle still resembles that of the lower animals.[2] On the whole, however, it may be said that menstruation in its fully developed form is a human character. Not only is the flow more copious generally as the animal approaches Man, but among the lower human races it is less pronounced than among the higher races; American Indian women, for instance, as Holder has found, usually only menstruate for two days.

The fact that women are thus, as it were, periodically wounded in the most sensitive spot in their organism, and subjected to a monthly loss of blood, is familiar. It was inevitable that to the supposed weakening influence of this loss of blood should be attributed all sorts of characteristics of the feminine organism, especially the earlier arrest in development, and the slighter and weaker build. We have to remember, however, that in many mammals who do not menstruate the male is more vigorously developed than the female. We are here concerned, not with a trivial periodic loss of blood, but with the whole of the special adaptation of the female for the chief part in reproduction. That inevitably involves the preparation for a use of energy otherwise available in directions which for the female are superfluous, while yet leaving her, equally with the male, a completely adequate organism.

The significance of menstruation thus lies in the fact that it is merely the external sign of a profoundly significant

[1] F. H. A. Marshall, *The Physiology of Reproduction* (2d ed., 1922), 107. A detailed discussion will be found in this standard work.

[2] Walter Heape, 'The "Sexual Season" of Mammals,' *Quarterly Jour. Microscop. Soc.*, 1900 (with a useful bibliography). See also Havelock Ellis, 'Sexual Periodicity,' *Studies in the Psychology of Sex*, I, and in VII, 'The Menstrual Curve of Sexual Impulse.'

inner process which only incidentally involves a slight loss of blood. We may say with Blair Bell that it is, more essentially, a function, under the control of the ovarian and other internal secretions, whereby is more or less regularly excreted a superabundance of chemical products, notably calcium (lime) salts, which had previously been used to build up the skeleton, but are now accumulated for the special needs of the female in the formation of her child or in the secretion of milk to feed it, whence probably the frequent tenderness of the breasts during menstruation. Blair Bell has found that the menstrual discharge may contain a quantity of calcium even thirty times greater than that found in the blood in the system.[1]

So it is that while the special reproductive development of the girl arrests the growth in other directions which is carried farther in the boy, this special development is so far from being a source of weakness that, as Dr. Alice Clow finds, its early appearance is associated with general physical fitness. Her observations, covering nearly three thousand girls, show that maximum growth, first in height, then in weight, takes place during the three years preceding the onset of menstruation; that in the year in which menstruation appears there is a definite fall in rate of growth, both as regards height and weight, though both continue, at a reduced rate, after menstruation appears; and that, although most girls cease to grow at sixteen and many at that time begin to lose weight (as is normal in girls soon after growth is completed), girls who do not menstruate till they are seventeen continue to grow till they are nineteen, and girls who menstruate early cease to grow early.[2]

It is not difficult, however, to see how this function has given origin to the notion that women are natural invalids. Thus in the eighteenth century Galiani, in his 'Dialogue sur les Femmes,' describes woman as 'un animal naturellement faible et malade.' 'At first she is an invalid,' he re-

[1] W. Blair Bell, *The Sex-Complex*, 35.
[2] A. E. S. Clow, *Brit. Med. Jour.*, 10 Sept., 1927.

marks, 'as all animals are until they have attained their full growth; then come the symptoms so well known in every race of man, and which make her an invalid for six days during every month on an average, which makes at least a fifth part of her life; then come pregnancies and lactations which, properly considered, are two troublesome disorders. Women, therefore, only have intervals of health in the course of a continual disease.'

Michelet, the historian, in his book 'L'Amour' (1859), expounds the same idea that women are invalids; 'woman is for ever suffering,' he says, 'from the cicatrisation of an interior wound which is the cause of a whole drama. So that in reality for fifteen or twenty days out of twenty-eight — one may almost say always — woman is not only invalided but wounded. She suffers incessantly the eternal wound of love.' It is scarcely necessary to point out that a condition of invalidism can scarcely be called normal. A function which affects half the human race cannot be dismissed as a mere symptom of ill-health.

While this periodic loss of blood has always attracted attention, and has furnished a more or less hazardous basis for various poetic and scientific suppositions, it is only within recent years that it has come to be recognised that menstruation is but the outward manifestation of the climax of a monthly physiological cycle which is in progress throughout the month. The exact nature of the process cannot yet be said to be quite definitely and indisputably known. It would appear that ovulation — the emergence from a maturing graafian follicle in the ovary of the egg that may or may not become fertilised — takes place between about the thirteenth to the seventeenth day of the menstrual cycle, and from this point a state of what may be called pseudo-pregnancy sets in until about the twenty-eighth day. Then the pseudo-pregnancy breaks down and menstrual hæmorrhage begins, being a kind of abortion of that pseudo-pregnancy. But there is no rest period, or anœstrum, in the human species. The abortion

of the last ovulation is complicated and in a sense masked, by a new glandular activity and hyperæmia, corresponding to 'heat' in lower animals, favourable to conception, and preparatory for the next ovulation. 'The stage is being set for the next scene,' it has been said, 'which Nature trusts may be more successful.' [1]

There is reason to believe that this sexual cycle is mirrored in the whole of a woman's physical and psychic organism, so that she is always on the upward or downward slope of a curve. It is to American physicians that we owe the formulation of this wave-theory. The idea was first thrown out, as was fitting, by a woman, Dr. Mary Putnam Jacobi, in 1876, and in 1878, Dr. Goodman set forth the conception more in detail in the 'American Journal of Obstetrics.' Many other investigators have developed the conception in various directions, and Professor Van Ott, of St. Petersburg, made a large number of daily examinations of sixty healthy women which revealed a monthly curve in temperature, muscular force, vital capacity, and reflex action, the processes in which Dr. Mary Jacobi had anticipated the existence of the curve and at some points indeed already demonstrated it. Since then many investigations have been made in many countries, and while the results have sometimes varied, the reality of the curve is now seldom questioned, although its extent, regularity, constancy, and significance have sometimes been exaggerated or minimised.[2]

With regard to a menstrual curve of temperature there

[1] B. Whitehouse, 'Recent Views of the Menstrual Function,' *Brit. Med. Jour.*, 21 April, 1928.

[2] Various investigators have prepared charts of the menstrual wave, but Van Ott's (*Nouv. Arch. d'Obstet.*, Sept., 1890) is best known, and is reproduced on page 119, the line *AB* representing the curve of oscillation, *EC* the degree of intensity of functions represented, and *mn*, shaded, the menstrual period. Engelmann remarks that it is 'thoroughly in accord with my own observations with reference to the physical and psychical changes during the monthly periods, characterising the menstrual wave in all its phases. It is almost equally correct for morbid nervous symptoms as characterised by the hysteroneuroses.' But the chart need not be regarded as having more than diagrammatic value.

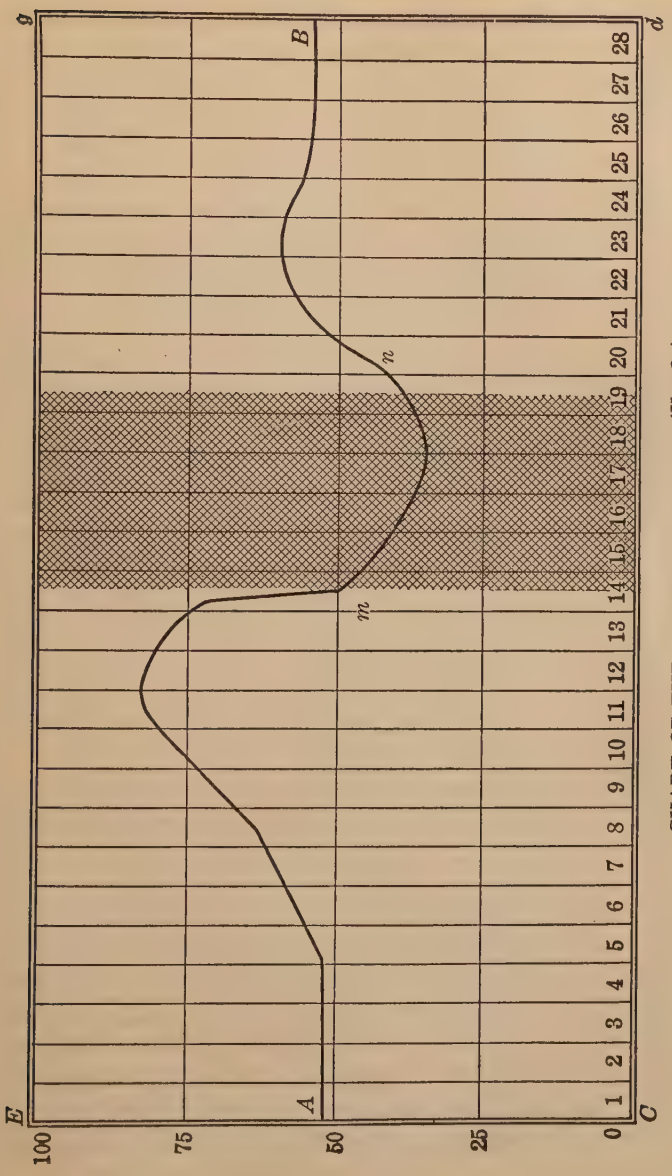


CHART OF THE MONTHLY CYCLE (*Van Ott*)

is a fair amount of agreement. Jacobi, Ott, Giles, Reinl, Zuntz, and others have recorded a curve, usually showing a maximum just before menstruation, and usually followed by a fall during the period, though a few observers have found the rise continued during menstruation. The rise is small and may not be more than half a degree when taken by the mouth, so that some observers have failed to notice it at all, but it may be much more pronounced when the rectal temperature is taken. This cycle in temperature is so marked that it has even been asserted that 'woman during the period of sexual activity has no normal temperature.' The curve may be well observed in apparently afebrile sanatorium patients, as they are liable to exhibit it in an exaggerated form. Thus Turban of Davos, describing varieties of such curves, found the most frequent to be that which may be regarded as a more pronounced form of the normal curve; it occurred in 73 per cent of his cases and showed a rise at a time varying from a few hours to fourteen days preceding the onset of the period; it had no bad significance, whereas in the cases in which a rise occurred after the period it was almost always of bad import. Cornet of Berlin similarly found a premenstrual rise of temperature in two-thirds of his cases of tuberculous disease in women.

The heart was naturally one of the first organs to attract attention with reference to menstrual periodicity. Cullen long ago maintained that the pulse-rate rises at the approach of menstruation. Subsequently Stephenson, Zuntz, and others have noted a menstrual curve of the pulse. Perrycoste, a careful observer, who has been much occupied with the pulse, made an interesting series of daily observations during several years on one subject. The results of this investigation show a rise to the highest point of the monthly curve about three days before the onset of menstruation, falling to the lowest point in the cycle in the first or second day of menstruation, then rising during the rest of the period and falling on the last day;

about the ninth or tenth day (counting from the first day of menstruation) there is a high point; and then, about the thirteenth to the fifteenth days, a high point, invariably higher than that on the ninth to tenth, and usually the highest point after the pre-menstrual climax.[1]

With regard to blood pressure the evidence has sometimes been discordant, the reason apparently being the difficulty of eliminating disturbing factors. Burlage, among a large number of public schools at Ithaca, New York, and women students at Cornell, found a general rise in systolic pressure up to the age of fourteen (when nearly all these girls had begun to menstruate), then a level for a year followed by a fall to a minimum at eighteen, after which it remained constant. Mary Jacobi, Giles, Clelia Mosher and others have found a high blood pressure, followed by a fall, near the beginning of the menstrual period. But some observers find no definite rhythm. Importance may, however, be attached to some observations by Amos because the subjects, being in a sanatorium, were living a completely regular and equable life. The systolic pressure was taken on twelve patients by the ordinary mercurial sphygmomanometer, and the charts of all these patients show a decided fall of pressure during the first day or two of the period, often preceded, a day or two earlier, by a rise; while at the other end of the period, or a day or two later, there is again a rise. Amos points out that, as these women were all suffering from chronic pulmonary tuberculosis, the *absolute* blood pressure may be pathological, but we may fairly regard the *relative* change in pressure as normal.[2]

It may be supposed that these physiological waves are associated with a corresponding curve of metabolic activity. But in regard to this opinions are not uniform, and Marshall agrees with Van Noorden that the menstrual wave must not lead us to premature conclusions concern-

[1] *Med. Review of Reviews*, May, 1919. It is interesting to compare this curve with the monthly curve of the sexual impulse as given in 'The Menstrual Curve of Sexual Impulse,' in *Studies in the Psychology of Sex*, VII.

[2] S. E. Amos, *Lancet*, 4 Nov., 1922.

ing metabolism. Sfameni found increase of blood corpuscles just before menstruation and decrease during the period, as also of hæmoglobin. Blair Bell attaches much importance to increased calcium excretion in menstruation. Grete Gumprich could find no precise rule for changes in the blood corpuscles during menstruation; the relation varied in different individuals, and in the same individual at different times. Marion Wiltshire could not find evidence that the menstrual wave extended to blood pressure and metabolism. She made observations at the London Women's School of Medicine on basal metabolism (i.e., respiratory output) and on cost of work (measured by oxygen intake and carbonic acid output) and could find no decided difference between menstrual and inter-menstrual periods.[1] Miss G. M. Bedale, under the direction of Professor Cathcart, made systematic observations during three months on the basal metabolism and other physiological phenomena in a single subject, under strictly controlled conditions, and found a heightening of functional activity towards the end of the inter-menstrual period, followed by a fall when menstruation began; but this was not greater than the variations that might occur at other periods.[2] A number of the older investigators found diminished urea during the period, though in occasional cases an increase. Muriel Bond finds a relation between the ammonia coefficient and menstruation, with a marked rise during the seven days previous to the period, apparently due to a rise in the total output of urinary ammonia.[3]

An investigation, also carried on at the London School of Medicine for Women, by Professor Winifred Cullis and a specially selected and reliable group of sixteen women medical students, reached results, after daily observation during three to eleven months, which show the now most

[1] M. A. P. Wiltshire, *Lancet*, 1921. A useful bibliography is given down to that date.

[2] *Industrial Fatigue Research Board Report* for 1927. [3] *Lancet*, 4 Nov., 1922.

clearly established features of the physiological menstrual cycle. It was not considered that the blood pressure results indicated a definite and uniform variation, but it must be noted that in eight out of eleven cases there was a fall during menstruation, which accords with the more definite results of some other observers. The pulse curve is clearly marked, the menstrual and immediately post-menstrual frequency being always lower than the rest of the cycle, and the menstrual lowest in all but three cases; this is followed by a rapid post-menstrual rise. The average range of variation was four beats per minute and never more than ten. The temperature curve (taken both orally and rectally) confirmed that reached by other observers, with a maximum rise before menstruation, a rapid fall to a menstrual minimum, and a post-menstrual rise less rapid than that of pulse frequency.

Various observations have been made bearing on the influence of the menstrual cycle on voluntary motor capacity. Thus Epstean, under Professor Lee, investigating ten healthy young women by daily tests with the spring balance during five months, found an average loss of muscular strength of about 5 per cent during the menstrual period. Voitsechovsky in Russia (according to Leta Hollingworth) found various changes in six subjects during menstruation, such as lengthening of choice reactions (though not of simple reactions), weakening of concentration, lowering in quality of mental work, etc. Leta Hollingworth found with the tapping test, for steadiness and fatigue, etc., that there was usually an increase of proficiency a day or two before menstruation, decrease during menstruation, but not usually any constant change after menstruation, and she regards the average performance as not usually lessened during menstruation.[1] Jaworski re-

[1] Leta Hollingworth, *Columbia University Contributions to Education*, no. 69 (1914). Most of the observations here recorded show no definite results, and some of those, dealing with ability for spurts of work, have no bearing on the existence of a menstrual cycle. In England also Miss S. C. M. Sowton (*Industrial Fatigue Research Board Report* for 1927) found among University

ported among his patients in Austria (authors, officials, etc.) that, as they themselves admitted, errors in arithmetic, transcription, etc., and loss of memory were distinctly more common during menstruation than at other times.

The fact that — apart altogether from anything that could be regarded as a continuous menstrual cycle — the actual period of menstruation is accompanied by a great variety of physical and psychic symptoms, which differ widely in different individuals, has long been familiar. Even in perfectly healthy women this affects the whole organism to a more or less marked degree. There is a general feeling of tension in the pelvic organs; the breasts also are slightly enlarged, and may be somewhat tender and painful. The same congestive tendency shows itself in the enlarged thyroid. The surface blood-vessels tend to be fuller than usual, so that there may be flushing of the face. There is increased nervous tension and greater muscular excitability; reflex action is more marked, and there may be slight twitchings of the legs; also yawning and stiffness in the neck, and sleep is heavier than usual. There is loss of appetite and a certain amount of digestive and intestinal disturbance with a tendency to flatulence, increase in gastric acidity and amount of gastric secretion, with diminution of gastric motility and general weakening of the stomach. Thirst may be present, and urination more frequent than usual. There is a tendency to pigmentation; the circle around the nipple usually becomes somewhat darker, the complexion is changed, losing its clearness, and a dark ring may be perceptible around the eyes; these pigmentary changes are more especially observed in brunettes, and, like many other disturbances of menstruation, during pregnancy they become still more marked. In some women the breath and also the skin exhale an odour of a peculiar aromatic and not unpleasant character. The voice also may undergo a change; there is a tendency

students and factory workers that women varied widely in their muscular and mental reactions during menstruation.

to hoarseness, and singers sometimes lose the brilliancy of their high notes.[1]

Most of these physical signs may exist in women whom we must consider to be in a state of good health, although we need not expect to find them all in the same person; to a skilled observer it is often easily possible to detect the presence of the monthly period. On the psychic side, even in good health, there is another series of phenomena. There is greater impressionability, greater suggestibility, and more or less diminished self-control. It is at this time, in those women who are at all predisposed, that sudden caprices, fits of ill-temper, moods of depression, impulses of jealousy, outbursts of self-confession, are chiefly liable to occur. G. V. Hamilton, in his 'Research in Marriage,' among women of good social class, found that 54 per cent of married women admitted depression just before menstruation. In turning over the pages of a young woman's diary, Icard remarked, very little skill is required to detect those written during the monthly period.[2]

So far I have discussed only those phenomena of the menstrual cycle which can fairly be regarded as normal and physiological. It is instructive to glance at the cases in which menstruation produces abnormal and diseased conditions, because what we see under such conditions is

[1] Lennox Browne, a well-known specialist, wrote to me: 'I believe that the pitch of the voice is often lowered at the menstrual epoch, although I have not found this to be universally admitted by patients. Many have told me that they have a disposition to sing flat, and in two cases the patients, who suffered from dysmenorrhœa, told me that they sang sharp, of which they were conscious — probably from information, for of course you know that those who sing sharp are not generally sensible of the defect. It is, however, generally agreed that the timbre and tone-quality is impaired, the voice being decidedly thinner and poorer during the epoch. On this point you may like to know that in all Continental engagements with female singers provision is made for suspension of duty during the menstrual period.'

[2] 'Mental energy and acumen,' remarks Engelmann (*Trans. Am. Gynecol. Soc.*, 1900), 'are, as a rule, diminished during the first days of the flow at least, as is affirmed by perhaps 65 per cent of the many questioned, who state that mental exertion and study at that time is more difficult and wearing, and requires greater effort, precisely as the working girl — only in a larger proportion of cases, 75 per cent — expresses impaired ability for work, saves herself, and relies upon her mates to complete some part of her task.'

simply an exaggeration of what takes place under ordinary conditions. There may be so high a degree of physical pain and disability that the woman is really an invalid for several days every month. All sorts of slight visceral affections, of a congestive character, may be due to menstruation, and recur periodically. On the mental side the irritability or depression may be so pronounced as almost or quite to amount to insanity. Migraine is a disorder common at this period; hysterical and epileptic fits often occur at this time.[1] Erotomania, dipsomania, and kleptomania are also specially liable to be developed. Whenever a woman commits a deed of criminal violence it is likely that she is at her monthly period. Lombroso found that out of 80 women arrested for opposition to the police, or for assault, only 9 were not at the menstrual period. Legrand du Saulle found that out of 56 women detected in theft at shops in Paris, 35 were menstruating. There is no doubt that suicide in women is specially liable to take place at this period; Krugelstein stated that in all cases (107) of suicide in women he had met with, the act was committed during the monthly period, and although this cannot be accepted as a general rule (especially when we bear in mind the frequency of suicide in old age), Esquirol, Brierre de Boismont, Coste, Moreau de Tours, R. Barnes, and many others have noted the frequency of the suicidal tendency at this period.[2] In England Wynn Westcott stated that in his experience as a coroner, of 200 women who committed suicide, the majority were either at the change of life or menstruating; [3] and in Germany Heller ascertained by post-mortem examination of 70 women who had committed suicide that 25 (or in the proportion of 35 per

[1] Thus Fisher found that out of 60 epileptic women, in 16 the menstrual period was either the only time at which the attacks took place, or they were much increased in frequency at that time. (*New York Med. News*, Nov., 1891.)

[2] A full discussion of the mental condition of women during the menstrual period will be found in Icard, *La Femme Pendant le Période Menstruelle* (Paris, 1890). See also F. Leppmann, *Archiv f. Frauenkunde*, Bd. XIV, Heft 4 (1928).

[3] *Lancet*, 11 Aug., 1900. Steiner more recently found that of 39 women who committed suicide, 22 were at the period of menstruation.

cent) were menstruating, a considerable proportion of the remainder being pregnant or in the puerperal condition. In Vienna Pilcz found that of 211 women who committed suicide 36 per cent were menstruating or about to menstruate and Gaupp's experience is very similar. Women in prison, again, are apt to exhibit periodic outbursts of unmotived and apparently uncontrollable violence: these 'breakings out,' as Nicolson and others have observed, are especially liable to occur at the menstrual epoch. Among the insane, finally, the fact is universally recognised that during the monthly period the insane impulse becomes more marked, if, indeed, it may not appear only at that period. 'The melancholics are more depressed,' as Clouston puts it, 'the maniacal more restless, the delusional more under the influence of their delusions in their conduct; those subject to hallucinations have them more intensely, the impulsive cases are more uncontrollable, the cases of stupor more stupid, and the demented tend to be excited.' These facts of morbid psychology are significant when we remember that pathology is but an exaggeration of physiology.

Such considerations bring us to the much-debated question of the health of women at the menstrual period and their adequacy at that time for their ordinary tasks and special employments. While it is now generally agreed that the 'ordinarily healthy' woman is as fit for work every day of her life (apart from childbirth) as a man, it has not been quite clear how many women are 'ordinarily healthy.'[1] Even when we turn to the conditions of savage life, this point is not satisfactorily cleared up. Among savages in the most various parts of the world women are more or less exempted from work during menstruation, and isolated.[2]

[1] Hauptmann has lately divided women into five different classes in this respect, the first and most finely equipped being even at their best during the menstrual period, while the fifth and last class, the least stable, then approach a manic-depressive condition. Quoted by Leppmann, *Archiv f. Frauenkunde* (1928), 301.

[2] Details of the practices at menstruation in different parts of the world are given in Ploss, *Das Weib* (11th ed.), I, 706–56. As regards the ideas underlying these customs, see, e.g., A. E. Crawley, *The Mystic Rose* (2d ed., 1927).

These customs are always connected with ritual taboos, and are believed to be necessary in order to avoid the risks of social dangers; they are not held to depend on the state of the woman's physical health. If, however, rest is of benefit to a woman's health at that time, such taboos would be an advantage to her, and to some it has seemed possible that motives of this kind may underlie and justify the taboos.[1] It is unlikely that they were ever instituted consciously with any such aim, but the question of the relation of women to daily work during menstruation is complicated by these taboos since both in savagery and in civilisation we thus find a tendency to the custom, however unlike the motives, of isolating women at this period. Indeed, even in civilisation, it has seemed to be sometimes more of a traditional ritual than an actual demand of the women's physical state. 'Women have been led,' Whitehouse remarks, 'by tradition and superstition to expect a certain amount of pain at the menstrual epoch, and we see an expression of this mental attitude in the term "poorly time."[2] If pain is expected its incidence is favoured.' He admits, however, that 'discomfort' and 'a condition of unstable nervous equilibrium' may be regarded as the rule, but that women should 'learn to carry on in spite of it.' What he regards as 'essential dysmenorrhœa' or difficult menstruation, which is uterine colic, he finds to be rare.[3]

[1] Dr. F. D. Bana, a Parsi, writing from Bombay (*Brit. Med. Jour.*, 11 Dec., 1920) in support of the statement of Dr. Mary Andrews that 'though a natural function, menstruation is a temporary drain on a girl's vital energy and calls for special care,' remarks: 'This reminds me of a very good principle we Indians have. As a rule, including us Parsis, there is a custom that no girl or woman should do any heavy work, even domestic work, for at least three days during her course, and was bidden to rest by isolation in a separate room and bed. This was enjoined as a strict religious behest until now; and the principle was good, as it gave her good rest and kept her to herself in a way.' He adds: 'Unfortunately this is being given up now, and a Parsi girl of the present day goes about as she likes.'

[2] Löwenfeld, however, who discusses the normal and abnormal manifestations of menstruation in his *Sexualleben und Nervenleiden* (5th ed., 1914, pp. 35–48), remarks that this expression is far from a mere figure of speech.

[3] B. Whitehouse, *Brit. Med. Jour.*, 21 April, 1928.

But there are widely different ways of estimating dysmenorrhœa. One can scarcely fail to agree with Dr. Alice Clow when she says: 'Surely any pain or discomfort endured during working hours must detract from the value of the work done; it is important that dysmenorrhœa, however slight, should not be disregarded, but should be cured if possible.'[1] She is able to record a very large fall in the numbers suffering at menstruation during the thirteen years of her observations on school girls and training-school students, indeed no less a fall than from about 47 per cent to about 11 per cent. This fall seems to be due in part to the acquisition of a different mental attitude (the earlier mothers having taught their daughters that they must not expect to feel well at this time) and in still larger part to a more healthy life and the observance of sound hygienic rules (moderate exercise, warm baths, etc.) during the period. Dr. Clow considers that 'when menstruation is normal the girl is free from any pain, headache, sickness, or feeling of discomfort'; that it is possible to 'abolish practically all menstrual suffering in healthy girls under 18 years'; and that even in adult life menstrual suffering might be a rare complaint if healthy habits of life were continued. Dr. Clelia Mosher in America is of the same opinion.[2]

Professor R. W. Johnstone of Edinburgh confirms the opinion of the bad influence which has been exerted by mothers in this matter of promoting the menstrual invalidism of their daughters, and thinks that it must be strongly counteracted on behalf of the women of the future. 'This is one of the points,' he remarks, 'which the war brought home to me. I have had many patients who have told me that before the war they suffered regularly and severely from dysmenorrhœa, but that when they were employed in the hard work of nursing or driving ambulances in France — work which brooked no interruption on account

[1] A. E. S. Clow, *Brit. Med. Jour.*, 27 Sept., 1924, and 10 Sept., 1927.
[2] C. D. Mosher, *Personal Hygiene for Women* (1927).

of anything but absolute physical disability — their dysmenorrhœa entirely disappeared.' [1]

Dr. Paton, from his experience at the St. Andrews School for girls (of well-to-do social class) confirms Dr. Alice Clow's results, and finds that regular menstrual pain only occurs in 9.2 per cent of the girls, and was severe only in .26 cases. But there is an interesting difference in the menstrual regimes prescribed by Mrs. Clow and Dr. Paton. The former permits all games and exercises as usual; the latter prohibits all severe games and exercises (but allowing walking exercise) during the first three days of the period. Since his results are at the least equally good, it is evident that strenuous exercise is not essential to health. Paton believes that it is often harmful, and finds that though the comparative rest at the monthly period is sometimes at first resented by the girls it proves undoubtedly beneficial under modern school conditions, when competition in games is so great and the educational standard involves such strenuous work, and that all the house mistresses are in agreement as to this benefit. He refers to the tendency under the prolonged stress of these conditions for menstruation to become irregular or absent, indicating a defective ovarian secretion due to impaired vitality. He points out that in some school-girls menstruation only becomes normal and regular during the holidays. He quotes the authority of Munro Kerr on the influence of undue athletic or mental strain in disturbing menstruation, and of Professor McIlroy on scanty menstruation as the first danger signal of overwork for examinations (and her warning that strenuous games or study must not be permitted without previous medical examination), and he refers to the effect of overwork in industrial occupations on Italian women.[2]

[1] R. W. Johnstone, *Brit. Med. Jour.*, 10 Sept., 1927. Among the masses of the population, however, in the belligerent countries the War had a far wider influence in causing defective menstruation due to nervous worry and lack of proper food. As regards Germany, see Schneider, *Archiv f. Frauenkunde* (1929), 42.

[2] J. H. P. Paton, *Brit. Med. Jour.*, 10 Sept., 1927. Reference may here be

The picture here presented is that of the girl of to-day. It is much more favourable than that presented half a century ago, or even that still to be found among the adult women to-day. Brierre de Boismont in France in former days found that 77 per cent of women suffered pain at the menstrual period. In America Dr. Mary Jacobi, fifty years ago, though emphasising the normal character of the menstrual function in healthy women, found that 'in our exciting social conditions 46 per cent of women suffer more or less at menstruation' and that many of them ought to rest from work during the period. In London, as recently as 1913, Dr. Florence Willey found that 55 per cent of her patients suffered from painful menstruation, though only about half that proportion among working women. In America, thirty years ago, Engelmann studied the matter on a wide basis among many different groups of girls and women, and in some of them found the proportion who suffered at menstruation extremely high, even allowing for the inclusion of all suffering greater than 'trifling discomfort.' The highest was 95 per cent of suffering in a college, the investigation being carefully carried out by one of the medical officers of the college; even the lowest was 33 per cent in the senior classes of a high school. Severe suffering was found on the whole in from 11 to 18 per cent. Work girls who had to stand all day (as behind the counter) showed a very high percentage of suffering; those who sat (stenographers, etc.) less; and still less those who were free to move about (cash girls, packers, etc.).[1]

All these inquiries into the prevalence of dysmenorrhœa were made without any reference to the special constitutional type of the girl. This, however, we can now see to be a highly important factor. Sserdjukov regards painful

made to a wise and practical book of advice by Dr. Winifred Richmond, *The Adolescent Girl: A Book for Parents and Teachers* (New York and London: Macmillan, 1925); this book is written from the standpoint of to-day, with recognition both of the naturalness of the menstrual function and its wide variations in different individuals.

[1] G. J. Engelmann, 'The American Girl of To-Day,' *Trans. Am. Gyn. Soc.* (1900).

menstruation as 'the prerogative of incompletely valid types.' In estimating its frequency among different types pathological conditions were so far as possible eliminated, so as to ascertain the genuine influence of constitutional type on painful menstruation. It was found that the largest proportion of suffering from dysmenorrhœa (50 per cent) was among the hypoplastic, that is to say the least-developed physically; the asthenic (the slender but not unhealthy or undeveloped) type at 23 per cent, while the pyknic (the plump rounded type with large body cavities) suffered least with only 14 per cent. When physicians have become familiarised with constitutional types, it should be possible to form an opinion before the onset of menstruation as to whether the girl is likely to suffer, and to recommend due precautions. The proportion of sufferers among these Moscow girls seems unduly high (though perhaps comparing favourably with Engelmann's figures for America thirty years ago) as it is probable that slight cases were not counted; but we have to remember the unfavourable conditions of life in Moscow during recent years. Aschner of Vienna, it may be added, who attaches importance to complexion, eye-colour and hair in constitutional types, finds that excess of hair on the body is liable to be associated with menstrual trouble, especially defective menstruation.[1]

It is found in England at the Post-Office, and elsewhere where men and women are employed, that the women are more often absent from work than the men, owing to 'slight indisposition.'[2] Women workers indeed in most countries for which statistics exist are more often absent from work owing to indisposition than men. This applies to nearly all occupations and is usually most marked in the heaviest, though for agricultural work the sexual difference is not great. For bookkeepers and accountants it is very

[1] B. Aschner, *Archiv f. Frauenkunde*, XI, Heft 4 and 5 (1925).

[2] Among German teachers also, in ten of the largest German cities, during the period 1899–1909, the average was six days a year for men, and twelve for women. (*Sexual-Probleme*, July, 1913, p. 480.)

small.[1] The excessive sickness of women is a recognisable feature of statistical tables generally, and cannot be put down entirely, or perhaps even mainly, to the menstrual period, for it becomes more pronounced at the age from 45 to 65. At the same time the death-rate for women is lower. They easily fall ill but they do not easily die.

It remains true, and is now beginning to be established, that, provided the demands of a sound hygiene are fulfilled, there are no physiological processes in women which prevent them from taking a fairly satisfactory part in the economics of industry, or need seriously handicap them in professional or business life. Any adjustment to the special needs of women can be effected by reforms in the abuses of industry — undue monotony, excessive hours, lack of opportunity for exercise and recreation, etc.— which are admitted to be necessary altogether apart from the special needs of women. The investigations of the Industrial Fatigue Research Board,[2] based on a careful physiological observation of women at work, carried out by Dr. C. S. Myers, Miss Sowton, and Miss Bedale, in agreement with many previous observations, show the reality of the fluctuations which occur and demonstrate the existence of the wave-cycle. But they also indicate that 'there seems no reason to think that the fundamental physiological rhythm in women is such as to affect, either considerably or constantly, the quantity or quality of their industrial work, provided always that no pathological conditions are present.'

At the same time it also remains true — even although the fact has in the past been too heavily emphasised — that we cannot afford to deal ignorantly or recklessly with physiological processes; if we do we must needs pay the price. We have to recognise that as Professor Johnstone — who regards the supposed disability of women as a mere relic of the past — has put it: 'Despite any arguments to

[1] H. M. Vernon, *Industrial Fatigue and Efficiency* (1921), 167.

[2] Report no. 45 (London, 1928).

the contrary, reproduction is the greatest function of womanhood, and certainly it is the only one in which Mother Nature takes any special interest. She is almost obsessed with the one idea — reproduction of the species.' It is part of our business in life to humour that obsession, to adjust ourselves to its manifestations so far as to be able to gain our own ends. It is only by a certain degree of obedience to Nature that we are able to command her.

CHAPTER VI

THE GROWTH AND PROPORTIONS OF THE BODY

General characteristics of the male and female forms — Size at birth — Greater development of girls at puberty — Sexual differences in height of adults — Weight comparatively unimportant — Sexual differences in the growth and proportions of the body — The abdomen — The breasts — The chest — The arm — The hand — The index-finger — The leg — The foot — The future of the little toe — General conclusions.

When we contemplate the human figure — or, if we prefer, those classic representations of it which we owe to the genius of Greek sculptors — we note certain obvious sexual differences in form and contour. The man is larger, with a general tendency to rugged though not unbeautiful outline which conveys an impression of energy; his bony prominences are usually more conspicuous, and his muscles are everywhere more clearly defined. The woman is smaller and more delicately made; the bony points are less clearly seen, and the muscles, even although they may be powerful, are softly encased in abundant connective tissue which makes them less obvious. The man's form is erect and closely knit; the woman's is more uneven, with large hips and flowing protuberant curves of breast and abdomen and flanks. While the man's form seems to be instinctively seeking action, the woman's falls naturally into a state of comparative repose, and seems to find satisfaction in an attitude of overthrow.

It must be recognised that all these large distinctions are fundamental, and independent of race or epoch or stage of civilisation or type of social organisation, although, it should be unnecessary to add, this general rule is consistent with numerous exceptions, not only in individuals but even in large groups. It is also consistent with a drift of change confined within biological limits. Such a drift would appear to be the more marked character of many sexual distinctions among civilised peoples as compared with uncivilised

peoples, and in the white race as compared with the coloured races. 'I am of opinion,' Sir Arthur Keith, a high authority, has stated, 'that the sex differentiation — the robust manifestation of the male characters — is more emphatic in the Caucasian than in either the Mongol or Negro racial type.' And another authority, Dr. Parsons, speaking of the Anglo-Saxons of some fifteen centuries ago as compared with the English of to-day, remarks that he is able to confirm the opinion of Beddoe that in Anglo-Saxon skeletons the sexes are often difficult to distinguish, as the masculine skulls are often very feminine in type and the female skulls often extremely well developed.[1] At the same time it must always be remembered that there are limits to the rule, and Virchow, one of the greatest anthropologists of his time, long ago pointed out that among living individuals of New Guinea the sexual difference in height may be great, so that in some groups no woman reached the masculine minimum.[2] If we might accept the view championed by Briffault, that primitive human society is maternal and even matriarchal, men playing a comparatively subordinate part in culture, the later evolution of patriarchal society involving a high development of culture by men, we could perhaps see a reason for increased sexual differentiation.[3]

The sexual contrasts of this simple kind are fairly obvious and they have their significance. A more precise knowledge of the sexual differences in the human form has only grown up during the past century. The old masters, like Leonardo and Dürer, seem to have possessed a considerable science of human proportion, but their science does not appear to have been based on a wide induction of facts,

[1] Keith, *Lancet*, 27 Sept., 1919; Parsons, *Jour. Anth. Inst.*, XLI, 103.

[2] Virchow, *Zt. f. Eth.* (1889), III, 168.

[3] Briffault, *The Mothers* (1927), I, 442–47. Briffault concludes: 'To a large extent the secondary physical sexual characters of men and women would appear to be a product of social conditions and of artificial cultivation.' We could, however, at the utmost, accept this as true only 'to a large extent,' not without that qualification, which is almost certainly not stringent enough.

and they usually subordinated it to their art. Even on the surface of the body, it is remarkable, as Professor Arthur Thomson has observed (in his 'Handbook of Anatomy for Art Students'), how some of the finer distinctions between the sexes escape notice. During recent years anatomists and anthropologists have been engaged in building up a detailed knowledge of the growth and proportions of the human body according to age and to sex. They are yet far from having reached the end of their labours, but certain definite conclusions are becoming evident; and while we cannot here discuss fully a subject which has produced so large a mass of work, it will be possible to indicate some of the main results.[1]

At birth male infants are already rather heavier than female infants, and somewhat taller (about one-fifth of an inch in England and Scotland, according to the Anthropometric Committee of the British Association), and their chest-girth is greater.[2] During the first two years of life there seems to be little material for estimating sexual differences in height and weight. The data usually begin about the age of two and a half years and become abundant when the earliest school age is reached. Between the ages of two and a half and four and a half years nearly all the results reached show greater height and weight of boys; one Danish series shows girls taller at all these early years, but that is exceptional. During these years boys are the strongly growing sex, although during the following two years the relation is reversed. If we consider the height

[1] Manouvrier published a valuable anthropometrical study of the proportions of the body in the *Mémoires* of the Paris Anthropological Society in 1902. For the general problems of growth and development and decay, see C. S. Minot, *The Problem of Age, Growth and Death*, and F. H. A. Marshall, *The Physiology of Reproduction*, chap. XVI.

[2] H. J. Hansen in Sealand among 6000 infants found the average weight of the males 3696 grms., of the females 3542 grms. (*Lancet*, 19 July, 1913). This was in a rural district, and is in both cases 8 or 9 per cent higher than that of town babies. Weissenberg (*Wachsthum des Menschen*, 23) found the length of male infants at birth 51 cm., of females 50 cm. He remarks that all the dimensions of new born boys are greater than of girls, in a fairly regular relation, sexual differences not becoming clearly apparent until some time after birth.

attained in relation to the final height it is found that at two and a half years the boy has attained less, and the girl more, than half the final height. The coefficient of increase, or growth energy, of boys at this period is never attained at any subsequent period, and that attained during the following (4½ to 6½ years) period is only once attained again, about the age of fifteen. The energy growth of girls during the 2½ to 6½ age period is never attained again in later life. There is thus, as Schiötz insists, a real biological difference between boys and girls even during the early period of life, and we cannot correctly speak of any truly asexual period in life. Bartels and Stratz have agreed that during the whole period of growth there are alternate periods of height-increase and weight-increase ('stretching out' periods and 'filling in' periods), three of each, differently distributed through the years in the sexes; but it is doubtful if this view will bear careful examination.[1]

Results vary in different series and in different countries. Thus in Australia among 200,000 children of New South Wales, mostly pupils of the State schools, in respect to both height and weight girls are superior to boys from 5 to 11, when boys lead; rural children are heavier and taller than city children, and native-born than foreign-born, those with one native-born parent being intermediate.[2] Among nearly a quarter of a million German children, town and country combined, boys are taller and heavier than girls at the age of six and the difference slightly increases up to the age of ten, when girls begin to grow more rapidly than the boys and at the age of eleven overstep them, retaining the lead to the age of fourteen, when they slow down and the boys put on a spurt and surpass them.[3]

[1] Carl Schiötz, 'The Development of Children between the Ages of Two to Six Years,' *Pedagogical Seminary*, Dec., 1920; Report of the Anthropometric Committee of the British Association, 1883; E. M. Elderton, 'Height and Weight of Glasgow School Children,' *Biometrika*, Nov., 1914.

[2] Annual Report of Principal Medical Officer to the Department of Education, New South Wales, for 1918–19.

[3] *Grosse und Gewicht der Schulkinder* (Berlin, 1924), with an extensive bibliography.

Thus there is a sexual difference in what is called 'anatomical age,' and a girl is proportionally an adult when the boy is still adolescent. We may say, with Woodrow, that a child has three ages: chronological, anatomical, and mental, which may vary considerably in the same subject and be largely independent of each other. Woodrow finds in America that mental age corresponds more closely to anatomical age than to chronological age, and would thus largely dispose of any controversy as to relative sexual ability at school; 'when proper allowance is made for the girls' superiority in anatomical age they will be found slightly less intelligent than the boys.' [1]

Until about half a century ago it was supposed that the superiority of the male in height and weight is maintained throughout the whole period of development; this conclusion agreed with *a priori* ideas on the subject, and was supported by a few observations made by Quetelet. In 1872 Bowditch began to collect and publish statistics of the height and weight of nearly 14,000 boys and 11,000 girls in Boston and its neighbourhood. These investigations mark an epoch in our knowledge of human development; they were followed and confirmed in 1876 by those of Pagliani on a large number of Italian children; in 1883 by the Anthropometric Committee's Report on British children; in 1890 by Axel Key's observations on 15,000 boys and 3000 girls in Sweden; in 1891 by Emil Schmidt's investigation of nearly 5000 boys and 5000 girls at Leipzig, and by a great variety of observations more recently.[2]

[1] H. Woodrow, *Brightness and Dulness in Children* (Philadelphia, 1920).

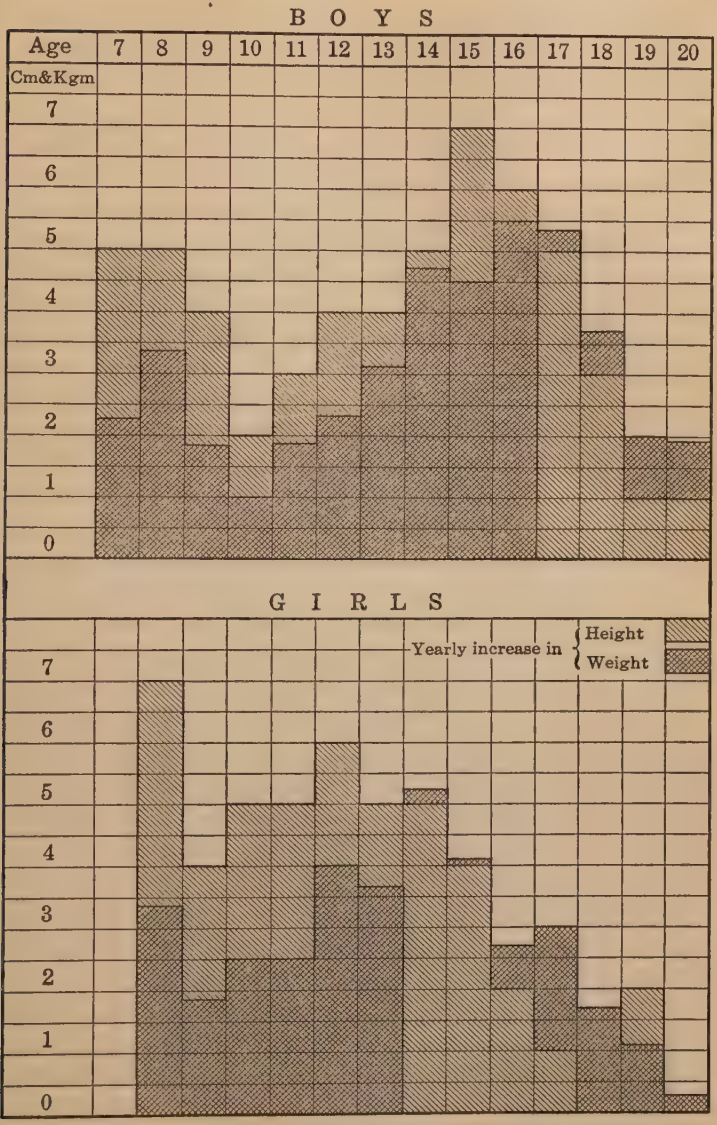
[2] Bowditch's original tables were published in the *Boston Medical and Surgical Journal*, Dec., 1872; his complete study, 'On the Growth of Children,' appeared in the *Eighth Annual Report of the State Board of Health of Massachusetts* (1877); for the British results, C. Roberts, *Manual of Anthropometry* (1878); Pagliani's first monograph appeared in the *Archivio per l'Antropologia* (1876), VI; Axel Key's paper *Die Pubertätsentwickelung*, read at the International Medical Congress of Berlin, was published separately, 1890. Schmidt's results are briefly stated in the *Correspondenzblatt der Deutschen Gesellschaft für Anthropologie*, April, 1892. As regards results on English children, later than those contained in Roberts's *Manual*, see *e.g.*, Kerr, *Report to Education Committee of London County Council*, 1906–07 (summarised in *Brit. Med.*

There can now be no doubt that, for a period of several years during the development of puberty, girls of European race are both taller and heavier than boys of the same age. The amount of the difference, and the exact age at which this predominance of girls begins and ceases, vary in different races and under different conditions.

In Great Britain girls grow more rapidly than boys between the ages of 10 and 15; and at the ages of 11½ and 14½ they are actually taller, and between the ages of 12½ and 15½ actually heavier, than boys at the same age. This was the result reached by the Anthropometric Committee of the British Association; the more recent results of Tuxford and Glegg as regards nearly 600,000 English children show that there is a slight predominance of girls over boys in height, though not in weight, at the age of 10, this being shown both in urban and rural districts, but it falls away at 11; the pubertal superiority of girls in respect to height and weight combined is established at the age of 13, the superiority in weight begins earlier, at the age of 12. At Liverpool girls were found to be taller than boys at every age from 9 to 14, except at 12. Among many thousand London County School children Kerr found that poorer-class girls are taller than boys from the age of 9 to 11, while girls of the better social class are outrun by the boys at the age of 10. In both classes girls were heavier than boys from the age of 7 (when the record began) to the age of 11.

The acceleration in the growth of girls seems to be coincident with a retardation in the growth of boys. At the age of 15 boys again take the lead, growing at first rapidly, and then more slowly, and their complete growth is attained, practically, about the age of 23. Girls, on the other hand, grow very slowly after the age of 16, and attain their full stature about the 20th year. Both in Europe and

Jour., 19 Jan., 1907), Tuxford and Glegg, *Brit. Med. Jour.*, 17 June, 1911. The general results of the facts in their wide bearing were discussed by H. H. Donaldson in the earlier chapters of his *Growth of the Brain* (1895), and by C. S. Minot in *The Problem of Age, Growth and Death* (1908).



YEARLY INCREMENTS OF HEIGHT AND WEIGHT BETWEEN AGES OF 7 AND 20 (*Axel Key*)

the United States the year of most active growth appears in boys to be the 16th, in girls the 13th or (as in Sweden) the 14th. The period of active growth is preceded by a period of marked delay in growth, reaching a maximum in about the 11th year in boys and the 10th in girls, in whom, however, it is less regular and conspicuous; this has been verified in America, England, Germany, Sweden, Denmark, and Italy. In the United States during the first 12 years of life, boys are from one to two inches taller than girls of the same age; at about 12½ years of age girls begin to grow faster than boys, and during the 14th year are about one inch taller than boys of the same age; during the 16th year boys again become taller. The English and American girls resemble each other on the whole more than the English and American boys, but the period of the developmental supremacy of the American girl is short and its degree is inconsiderable, while in Sweden it extends from the 12th to half-way through the 16th year; in Germany it begins during the 11th year and extends up to the 16th year; in Italy, also, it covers the same period, and is well marked in degree; in France (Paris) girls are taller than boys from the age of 11 to 14, and from the age of 8 to 15 they are heavier. The comparatively slight preponderance of the American girl is no doubt due to the great developmental activity of the American boy during the whole period of puberty; from his 13th to his 18th year he is the tallest and heaviest boy, on the average, yet produced and measured; during all other years, before and after, the Swedish boy comes to the top. The Swedish girl keeps at the head of European and American girls throughout her whole evolution, except, as regards weight alone, during her 14th year, when she yields to her American sister. In Sweden puberty both for boys and girls is a year later in reaching completion than either in America or Italy. All these variations are but minor modifications of the general rule that the evolution of puberty is more precocious in girls than in boys, being both begun and completed at an earlier age.

Porter concluded from his investigations in 1892 among 33,500 St. Louis children that the tallest and heaviest are the most intelligent. His results were criticised, and Gilbert found that among Iowa children, so far as there is any difference at all, it would appear that the taller and heavier the children the duller they are. Mochi at Florence also found a very decided inferiority of stature among intelligent as compared to unintelligent boys, and Buschan brought forward various series of data showing that while there is much reason to accept a relationship between large heads and intelligence, there is no reason to accept any relation between high stature and intelligence. Porter's conclusion was accepted by Sargent and was confirmed by Hastings at Omaha, Nebraska, by Christopher in Chicago, by Burgerstein in Vienna, and by various other investigators including Cyrus Mead and B. T. Baldwin. In London County Schools Kerr found that dullards tend to be below the mean height of their age, and clever or precocious children above, while (among girls) the group of children of any age and any standard generally average less height than those of higher standard but the same or even lower age. Mead at Cincinnati found that the more decided the mental defect the more checked the physical growth, and in height more than in weight. Feeble-minded girls, however, more nearly approached the normal girl than feeble-minded boys the normal boy. Bird Baldwin among children in New York and Chicago found that short light pupils tend to be immature in mental development, though sometimes precocious in brightness. It would seem, on the whole, that any unqualified statement is here unjustified, and there are marked exceptions to any rule. But we may probably accept the conclusions of Mumford, Medical Officer of Manchester Grammar School, extending over a period of years, that in growing boys there is a slight positive relation — not a close connection — between mental attainments and aptitude to excel in physical activities. This was confirmed by an

inquiry extending over twenty years on boys winning scholarships for Oxford and Cambridge. There would thus be a certain association between activity of mind and body, and the human being may be viewed as a unity.

While this conclusion is in harmony with most reliable investigations, it has sometimes been overshadowed by outstanding examples of brilliant activity coupled with feeble physical development, such as may occasionally be found in persons of genius, who, however, stand outside the normal range with which we are mainly concerned in anthropological inquiries. Karl Pearson concludes that a slow pulse-rate, a slow respiration rate and a low temperature, these all tending to be associated with a sound physical condition, are probably also associated with greater intelligence, though the bond is too loose to permit of searching for intelligence with a clinical thermometer or the second-hand of a watch.[1] This accords with the conclusion of Mumford that the physical superiority of the better scholars was more shown in breathing capacity than in weight and muscular power.

Axel Key pointed out that in Sweden the period of most rapid growth in boys is also the period of greatest freedom from disease, but found this relation between growth and resistance to disease less marked in girls, attributing the difference to the comparatively unhealthy conditions under which growing girls are placed; the same relation has been found in other countries, especially America. Thus at Chicago, Christopher states that, though there is a marked tendency to disease during the pubertal period, the mortality is low; and at Boston, as Hartwell showed, during the period from ten to fifteen years, when increase in height and weight is most rapid, the fewest deaths occur. The year of lowest death-rates for boys Hartwell found to be the thirteenth, for girls the twelfth, so that pubertal resistance to disease runs parallel with growth, though in boys the maximum growth falls a little later than the

[1] Karl Pearson, *Annals of Eugenics*, Parts 3 and 4 (1926).

minimum mortality. Hartwell pointed out also an interesting parallel between the prevalence of stuttering and pubertal development. Such prevalence varies at different ages, and the variation may be regarded as an indication of nervous balance. He found that boys of eight, thirteen, and sixteen, and girls of seven, twelve, and sixteen are specially apt to stammer, and concluded that the irritability of the nervous system of which stuttering is an expression is correlated with the most marked upward and downward fluctuations of the power of the organism to resist death-compelling influences.

The comparison of man and woman in weight and stature suggests various problems of general physique, of more especial interest in relation to women, which may be touched on here, although we shall approach them in other aspects later. The first point which naturally arises is the relation of the physique of women to their habits of life. It must be borne in mind that this relationship is close and that, therefore, the change by which women's habits of life are being approximated to those of men — a change in progress during the present century and not yet completed — is rapidly abolishing the artificial sexual difference in physique. This has been shown both in the United States and England. Thus Dr. Clelia D. Mosher, of Stanford University, California, has presented the results of the examination of over 4000 women of the University at entrance during the thirty years from 1891, when the University opened, to 1921. These students were said to be more nearly a fair sample of the general population than is usual at universities; moreover they came from nearly all the States, and not only from California where the level of weight and stature is rather higher than elsewhere. It is found that the average height during these thirty years has steadily increased from 63.2 in. to 63.8 in., while there is reason to believe that the actual increase is greater since in the early years such examination was only required of women electing to work in

physical training. At Vassar College there was during seven years an increase of well over 1.5 in. and at Smith College during twenty-two years of .8 in. There was also a corresponding increase in weight. These changes have occurred in spite of the fact that the average age of the

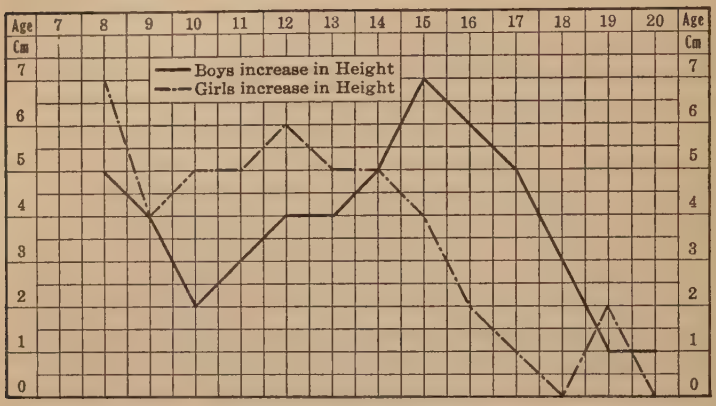


CHART SHOWING COMPARATIVE INCREASE IN HEIGHT OF SWEDISH BOYS AND GIRLS (*Adapted from Axel Key*)

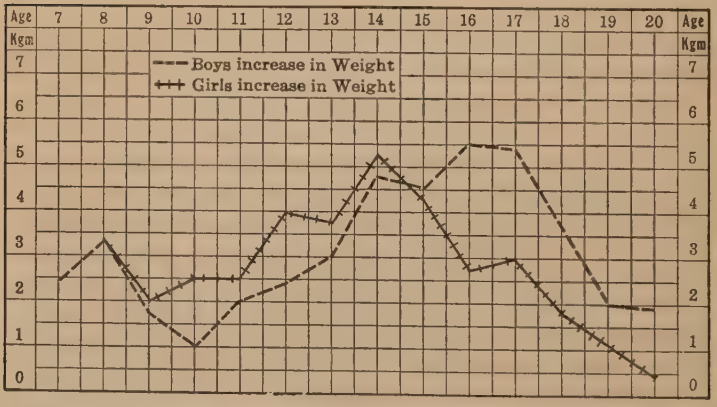


CHART SHOWING COMPARATIVE INCREASE IN WEIGHT OF SWEDISH BOYS AND GIRLS (*Adapted from Axel Key*)

women is now lower. Dr. Mosher considers that two great factors are concerned in the change: (1) the modern fashion of clothing which interferes less with women's hygienic life, (2) the increased physical activity, brought about partly by the change in dress, partly by the spread of bodily training and sports in schools and colleges, and partly by the change in the conventional attitude towards feminine activities.[1]

In England, similarly, it has been shown that women are increasing in height, and, in addition, that there is no corresponding increase in the height of men. Thus Professor F. G. Parsons, a leading authority, communicating the summary results of his investigations to the section of Anthropology of the British Association in 1927, after describing the increased health and beauty of London school children, even in some of the poorest districts,[2] a change which he ascribes to the spread of education, brings forward the results of a special inquiry among the well-nourished classes. He estimates the average height of English labourers, including the stunted population of the Midlands, as 5 ft., 5 in. But in 1927 the average height of the students at St. Thomas's Hospital had in no recent year fallen below 5 ft., 9 in., or risen to 5 ft., 10 in., an average which appears indeed to be higher than that of forty years ago. Among the students at the School of Medicine for Women, however, the average height has risen in ten years from 5 ft., 3 in. to 5 ft., 4 in., while in 1927 the average height of 150 nurses and massage students at St. Thomas's Hospital was 5 ft., 4.9 in. Parsons believes that the average height for Englishmen in general will become 5 ft., 9 in., and for Englishwomen will rise to 5 ft., 7 in.[3]

[1] Clelia D. Mosher, 'Concerning the Size of Women,' *California State Journal of Medicine*, Feb., 1921; 'Causal Factors in the Increased Height of College Women,' *Jour. Am. Med. Assoc.*, 18 Aug., 1923.

[2] Sir George Newman, Chief Medical Officer of the Board of Education, also shows in his report for 1926 (p. 12) that the English school child is increasing in stature and in weight.

[3] *Brit. Med. Jour.*, 26 Nov., 1927, p. 996.

Development is thus considerably influenced by alimentation and hygiene, that is to say by social class. But the influence of social conditions seems to be strictly limited. Pagliani and Axel Key gave special attention to this point. In Italy the differences in development between well-nourished and ill-nourished children are very marked, but Pagliani showed that though the development of the ill-nourished is slow, this is largely compensated by its prolongation, while the development of the well-nourished is rapid and precocious, but small in its later stages. (It is worth noting that in this respect girls follow the law of development of the well-nourished classes.) While alimentation enormously influences the rate of growth it has thus comparatively small influence on the final result, which is chiefly affected by race and sex. Axel Key found that the period of puberty is delayed in children of the poorer classes, but then takes place rapidly, to be completed at the same period as in the well-to-do classes. He compared the development of the poor to a feather which can be strongly bent only to fly back rapidly when the pressure is removed; but if the pressure is too great or too prolonged the retractility may be largely lost. It seems to be agreed that environment, alimentation, exercise, climate, altitude, occupation, modify the rate of growth with more intensity the more removed the individual is from the final stage of development. The height finally attained depends chiefly, but not entirely, on sex and race.

Thus there are limits to the equalisation of the sexes in height and weight possible by human effort. The more precocious development of the female is not a merely human but a widely spread zoölogical phenomenon. Among many animals it has been found that the females are ahead of the males in growth;[1] thus, although the adult male giraffe is taller than the female, at puberty the female is taller. In the ape also, Friedenthal states, the growth of the female stops at a much earlier age than that of the

[1] H. de Varigny, Art. 'Croissance,' *Dict. de Phys.*

male.[1] Even in the rabbit and guinea-pig development in the female seems to be more broken and oscillatory than in the male.[2] We see here at work the predominant part played by women in reproduction.

A woman may be said to reach her full development at the age of 20; a man continues to show a fair degree of development for some years after this age, especially under favourable conditions; thus Venn and Galton showed by their investigations on Cambridge students that the student's head, for example, grows after the age of 19 more than the average head. Full growth may not be attained either in the white race or (as Koganei found) in the yellow race until the age of 35. Karl Pearson considers that general growth may be said to cease at 27 in men and 25 in women, which is therefore the prime of life, but that as regards head measurements the prime is 45 in men and 55 in women, though in brain-weight it is 27 in men and only 19 in women.[3]

The lower the race, generally speaking, the earlier is the full stature attained; thus among the Nicobarese, according to Man, males reach their full height at about the age of 18, females a little earlier. Among the Melanesians of Matupi, Reche found, though the number of subjects was not large, that growth in boys is completed in the 18th year, and in girls in the 17th, when menstruation begins. The average body size of girls excelled that of boys during the whole period of growth, even at the age of four. It is not till they stop growing that the girls are excelled by the boys. Among 1500 children of the Philippine Islands between the ages of 6 and 21, in Manila schools, Bobbitt found that the girls appear to attain complete maturity in stature at 17, the boys three years later. Before the age of 14, the girls are at all ages taller than the boys. From the age of 8 to 15 the girls are absolutely heavier than

[1] Friedenthal, *Zt. f. Allgemeine Physiologie* (1909), 487.

[2] See Minot's diagrams in *Problem of Age*, etc., reproduced in Marshall's *Physiology of Reproduction* (2d ed.), 705 *et seq.*

[3] *Annals of Eugenics*, I, Parts 3 and 4 (1926).

the boys. In many other respects, also, as compared to European and American children, the Philippine girls are much nearer to the boys, being, if anything, stronger than the boys at 13.[1] In Japan, again, according to Baelz's measurements, girls are superior to boys at all ages before 12, after which the boys' superiority is established; maturity is here reached early in both sexes.

If further observation confirms these results, we may be tempted to wonder whether in the white race, if not indeed under the conditions of civilisation generally, the development of girls is unfavourably affected. The earlier puberty begins the shorter, in general, the race, the development of the sexual life appearing to put an end to any further vigorous continuance of general development. Thus Russian women are rather taller than Russian Jewesses, and menstruate rather later. Japanese women, however, who are short, menstruate at 15 (according to Yamasaki), and Chinese women at 17. Swedish women, who are about the tallest in Europe, menstruate at 17, which is later than the average age in almost any other part of Europe. At the same time, within the limits of a race, general physical growth and sexual growth are correlated, and, as Weissenberg shows, the period of most vigorous physical growth in a girl is that which is immediately followed by the efflorescence of sexual activity which seems to cut it short. Menstruating girls of 13 are found on exact investigation to have greater height, wider hips, and better developed breasts than non-menstruating girls of 15, who in all these respects are inferior.[2]

The average height of adult males in England, as estimated half a century ago, was about 1.700 m. (or 67.4 in.), of adult females about 1.600 m. (or 62.7 in.) the ratio of stature of men and women being thus 1 to 0.930, or as 16 to 14.88.[3] The mid-stature of the well-to-do male mem-

[1] Bobbitt, 'Growth of Philippine Children,' *Ped. Sem.*, June, 1909.

[2] *Wachsthun des Menschen*, 200 *et seq.*

[3] Report of Anthropometric Committee of British Association, 1883. As

bers of the British Association at Newcastle in 1889 was 1.715 m., of the female members 1.589 m. The sexual difference in stature in England, therefore, corresponds very closely with that found in neighbouring countries; in France, according to Topinard and Rollet, and Deniker (who considers the formula generally applicable)[1] it is 12 cm.; in Belgium, according to Quetelet, 10 cm.; in the United States, according to Sargent, it is somewhat greater, being nearly 13 cm. In America, while the sexual difference in weight is somewhat less than in England, the sexual difference in height and also in vital capacity is to a marked extent greater, the greater sexual differences being, it seems, due to the greater development of American men rather than to the less development of women.

Differences in weight, although instructive as regards the individual's condition, are not of any great significance in the adult from our present point of view, and are in some respects fallacious. This is due to the tendency of women to develop exuberant fatty connective tissue. It is a tendency which Manouvrier connects with the greater relative development of the abdominal organs in women as compared to the thoracic organs. Woman accumulates in her system incompletely oxidised material ready for impregnation or lactation, and when not otherwise utilised or integrated it forms adipose tissue. This tendency, while it is chiefly responsible for the charm and softness of the smoothly rounded feminine form, results in women possessing a larger amount than men of comparatively non-vital tissue, and makes them appear larger than they really

expressed by Galton (*Natural Inheritance*, 1889), it is about 12 to 13. In Belgium, where the race is shorter, the ratio, according to Quetelet, is as 16 to 15.

[1] The height of the Frenchwoman, according to A. Marie and MacAuliffe is 1.57 m. If we may accept the height (1.54 m.) of Parent-Duchâtelet's prostitutes in 1831 as applicable to the general feminine population, there has thus been a slight increase. Frenchmen are also increasing in height. A. Bloch states that the average height of French conscripts before 1906 was 1.65 m.; in 1908 it was 1.66 m.; and it is still rising. But the estimates of Amar (*The Human Motor*, 108) do not quite agree with these statements.

are. Bischoff once took the trouble to investigate the proportions of the various tissues in a man of 33, a woman of 22, and a boy of 16, who all died accidentally in good physical condition. He found the following relation between muscle and fat:

	M.	W.	B.
Muscle	41.8	35.8	44.2
Fat	18.2	28.2	13.9

It is owing to this tendency to put on fat that, as Quetelet found, while man reaches his maximum weight at the age of 40, woman reaches hers only at 50. The same tendency causes a liability to morbid obesity which all authorities agree to find more common in women; thus, for instance, of Bouchard's 86 cases, 62 were in women, and only 24 in men, while Le Gendre states that morbid obesity is twice as common among women. As we now know, this morbid obesity may be due to thyroid deficiency or to pituitary deficiency and tends to be associated with failing energy of the sexual system; so that it especially occurs after the change of life.

The greater amount of fat on the bodies of women was a fact familiar to the ancients, who took useful note of it at cremations. Thus Plutarch remarks in his 'Table Talk' (III, quæst. 4): 'Experience at funerals shows that the bodies of women are hotter than those of men, for they whose business it is to burn bodies always add one woman to every ten men, for this aids to burn them, since the flesh of woman is so fat that it burns like a torch.'

The preponderance of the adult man over the adult woman in total stature and bulk is fairly obvious and well established; the less obvious sexual differences in the growth and proportions of the various parts of the body are, however, more interesting and significant. Speaking generally, it may be said that, relatively to the total height, in women the head is longer than in men, the neck shorter, the trunk longer, and the legs and arms shorter.

Topinard found that, reckoning total height as 100, in

men of European race the trunk equalled 33.5, and in women 34.0. E. Harless, at Munich, found that in men the trunk equalled 35.9 and in women 37.8. Quetelet obtained similar results in Belgium. Riccardi examined 1200 Bolognese and Modenese persons of all ages and both sexes with reference to the height of the seated body, and found that in children under six there are no sexual differences; then comes a period of oscillation between the sexes, and finally the proportion of the height of the seated body to the total stature is in men as 52 to 100, and in women as 53 to 100; thus a woman, when seated, if we judge her by male standards, appears taller than she really is.

Ranke stated unconditionally that relative shortness of trunk is a character of superiority, as it indicates an organism arrived at maturity. If we compare the human adult with the human infant, or with the ape, this statement is justified. As Quetelet pointed out, while the adult head is only double the height of the head at birth, the trunk is nearly tripled in length, while the arms are nearly four times, and the legs as much as five times as long as they were at birth. This is one of those sexual differences which are simply the result of the total difference in bulk and stature due to the precocity and earlier arrest of growth in women.[1] In fairly well-proportioned men, in whom growth has been arrested before they have reached the adult male standard, we find the same proportions as in women. In a dwarf of the usual type, with his huge head and diminutive legs, the same infantile type is seen in an exaggerated degree. In defective development, due to the influence of rickets, it has been found that the trunk is on the average only about one inch shorter than usual, the arms two and a half inches shorter, while the legs may be as much as ten and a half inches shorter, thus preserving

[1] It may be also said, however, with Giuffrida-Ruggeri (*Archivio per l'Antropologia*, 1911, Fasc. III) that the relatively greater length of the trunk in woman, everywhere found, is simply a sexual character, involved by the function of maternity, and due to the greater length of the pelvis.

the infantile type.[1] In giants, on the other hand, the increased stature is chiefly due to undue growth of the legs.

It is not, however, true that relative shortness of trunk is a mark of superiority if we compare together the adults of various human races. Thus, as Topinard showed, Negroes possess relatively the shortest bodies, the yellow races the longest, while the white races occupy an intermediate position.

From these differences in proportion there naturally results a difference in the position of the centre of the body according to age and sex. The old artists and authors who occupied themselves with the canons of proportion, following the lead of Vitruvius, regarded the navel as the centre of the body. This is not exactly the case. The more immature the human body is the lower the navel is, and the higher the centre of the body. At birth the middle point of the body closely coincides with the navel, or, rather, it is two or three centimetres above it, but as growth proceeds the centre of the body falls until ultimately it is a little below the symphisis pubis in men, remaining a little higher in women.

It is interesting to observe, as has been well shown in a figure of Stratz's presenting the proportions of five women of different race from the Akka Pygmy to the European, reduced to the same scale, the variations in proportion thus revealed in an ascending order. In the Akka girl the head is relatively largest, gradually decreasing through Chinese, Fuegian, and Negrito Schuli to be relatively smallest in the European. At the same time the arms tend to be shorter, and the legs are regularly longer, while the navel is placed ever higher in relation to the total height, the middle line passing through the navel in the Akka girl and through the pubes in the European. Stratz finds that the developed Akka girl corresponds in proportions to the European at six years of age, the Chinese to the European

[1] Shaw, confirmed by Walter Pye, 'Lectures on Growth Rates of the Body,' *Lancet*, 26 July and 16 Aug., 1890.

at 10, the Fuegian to the European at 12, and the Negrito Schuli to the European at 15, so that the white woman thus presents, on the whole, as we might have anticipated, the highest stage in the scale of proportions.[1]

In women the distance between the navel and the pubes is greater than in men; that is to say that in women the abdomen is larger. This is the rule as stated by Manouvrier, and Cunningham found from the examination of numerous subjects that the various abdominal zones have the same average depth in women as in men; taking into account the greater size of the men, the relative size of the abdomen becomes thus distinctly greater in women.[2] This character is in harmony with the reproductive functions of women, and in the artist's hands the full and firm abdomen is one of the beauties of woman's form, in contrast to man's comparatively flat and inconspicuous abdomen, but at the same time a large abdomen is both an infantile and a primitive character; I have noted it, for example, in the Fuegians and a Fuegian boy with his abdomen exposed bore a strong resemblance to a woman.

A still more obvious sexual distinction lies in the breasts. The breasts of girls begin to develop, according to Weissenberg, who made careful observations among the South Russian Jews, before the tenth year.[3] The only sexual difference worth mentioning here, however, is the distance between the nipples. This is often greater in men than in women; the reason for this is, as Brücke points out, that in its development the breast in women requires a large amount of skin for its increasingly convex surface, and as the skin on the side of the body yields more readily than

[1] C. H. Stratz, *Arch. f. Anth.* (1911), Heft 2/3. Stratz has discussed the whole question of the canon of proportions in his well-known work, *Die Schönheit d. weib. Körpers.*

[2] *Jour. Anat. and Phys.*, Jan., 1893.

[3] Weissenberg, *Wachsthum des Menschen*, 143. In boys, also, a slight swelling and painfulness of the breasts sometimes occurs at puberty. Weissenberg notes that it usually occurs about the age of 14 or 15, and regards this as an illustration of the late sexual development of boys as compared to girls.

that between the breasts, the nipples tend to approximate.[1] 'The breasts should always live at enmity,' a sculptor once said to Brücke; 'the right should look to the right, and the left to the left.' In well-developed individuals this is so, and in the careful measurements of artist's models given by Quetelet at the end of his 'Anthropométrie' the exceptional distance between the nipples is noteworthy, especially in the case of women belonging to Rome and Cadiz.

Charpy made a careful study of 200 subjects — male and female, short and tall, fair and dark — in the dissecting room, with special reference to the shape of the chest. He found no notable sexual differences until the age of fifteen, and less well marked after this than many people imagine. He recognised three different types of the female chest, which are, however, more obvious to the artist than the anthropologist: (1) the *broad type*, square and full like that of a man, with well-spread shoulders, and breasts like expanded discs; it is the type of the ancient goddesses, of the women of Tuscany and Liguria, and the Roman women of Transtevere; (2) the *round type*, rarer and of more delicate and highly sexualised character; it is smaller and more folded in than the first type, with less antero-posterior diameter, and is the chest of the Venetian woman; (3) the *long type*, with oblong lungs, though its capacity is probably by no means defective; it is the type of English women, and Arab women with their sloping shoulders and graceful carriage often have this form.[2]

In women, generally speaking, while the trunk is relatively long, the limbs are relatively short. By her short arms woman approaches the infantile condition more closely than man, as Ranke points out, but it must be

[1] E. Brücke, *The Human Form*, 71, 72. Chapter III of this book is an interesting discussion of the artistic anatomy of the female breast. From the anthropological point of view the breast has been fully studied in the great work of Ploss, Bartels, and Reitzenstein, *Das Weib* (11th. ed., 1927), Bd. I, chap. VIII. These writers recognise four different forms of breast: the bowl-shaped (like half a tangerine orange), the hemispherical (like half or three-quarters of an apple), the conical, and the goat's udder shape.

[2] Adrien Charpy, 'L'Angle xiphoidien,' *Revue d'Anthropologie* (1884), 268.

added that by the same character she is farther removed than man from the ape and the savage, among whom the forearm especially tends to be long.

The difference is sometimes trifling, but there is agreement upon the point among most of the chief authorities. It was found to hold good among various lower races examined during the voyage of the Novara, and by Weisbach for German women also; Topinard lays it down as a general rule; Sargent found that the forearms of American girls are decidedly shorter, the arms very slightly shorter, than those of boys; and Ranke concludes as the result of his observations that women have shorter arms and forearms, thighs and legs, relatively to their short upper-arms still shorter forearms, and relatively to their short thighs still shorter legs, and relatively to the whole upper extremity a shorter lower extremity. Schwerz in Switzerland found also that girls have shorter arms than boys relative to the body-height, and that as compared to boys, girls have also, at all ages, a longer upper-arm as compared to the forearm. The arms of women, Pfitzner found, are relatively more shortened than are the legs. A long forearm, it may be added, as well as a long leg, are among the characters which indicate superiority when we compare the adult to the infant, though they indicate inferiority when we compare the European to lower races, like the Negro and the Australian, in whom the arms are especially long.

The male arm differs from the female by being flatter in youth and more highly moulded and less cylindrical in adult age; in women the arm in adult age develops in rotundity in consequence of the deposit of fat, and constitutes one of the chief beauties of adult womanhood; it is also often somewhat laterally compressed, and (as Brücke remarks) it is so depicted by Renaissance artists, in comparison with the broad shallow forearm. Artists have differed in their preferences with regard to boys' arms and girls' arms; thus, while Palma Giovane and many other

artists have given their angels girls' arms, Andrea del Sarto preferred boys' arms.

The shape of the hand and the proportions of its various parts have received considerable attention from time to time, and were studied in great detail by Pfitzner at Strassburg. Europeans, speaking generally, have smaller hands than the black races, while the yellow races have the longest hands; the Javanese, for example, have peculiarly long hands, which are seen to great advantage in the characteristic Javanese dances in which the hand plays the chief part. As regards the relative size of the hand, Quetelet and Topinard considered that there are no sexual differences; Ranke, however, found that the hand is relatively somewhat shorter in women, and this seems to be confirmed by Pfitzner's investigations, but in any case the differences are slight.

Sexual differences in the comparative length of the different fingers have attracted some attention. Ecker found many years ago that while in anthropoid apes, and so also in nearly all Negroes, the index-finger is shorter than the ring-finger, in women (including Negresses) the index tends to be longer than the ring-finger more frequently than in men, thus giving the hand a more elegant shape.[1] Mantegazza examined a large number of people with reference to this point, and found that while over 500 possessed a shorter index than ring-finger against under 100 with longer index-finger, among the former men were in a majority, and among the latter women were in a large majority; 77 per cent of the men, against 63 per cent of the women, showed the longer ring-finger, but only 7 per cent of the men against 21 per cent of the women showed a longer index-finger. Examining twelve beautiful women from various parts of Italy, he found a longer index-finger in six — a proportion considerably above the average; he adds that he is not prepared to say that he finds the longer index-finger itself more beautiful.[2]

[1] *Arch. f. Anth.*, Bd. VII, 65.

[2] P. Mantegazza, *Arch. per l'Antropologia* (1877), 22.

Pfitzner confirmed the fact of the greater length of the index-finger in woman, and finds also that woman's thumb is relatively shorter than man's.[1] The latter characteristic goes with a comparatively low type of organism, but the long index-finger has its interest, bearing in mind the conservative morphological tendencies of women, because it indicates superior evolution.

Weissenberg supported these conclusions; he found the predominance of the index-finger unusually marked in Jews, and especially in Jewesses, and he noted that in Assyrian reliefs and Egyptian statues the ring-finger is generally longer than the index, and in the former case at all events, of beautiful type.[2] Féré, who studied the proportions of the hands and the fingers both in men and women and in apes,[3] found that, if we compare the length of the different fingers to the middle finger, while the thumb is shorter in women than in men the little finger is relatively still shorter, while in the ape the little finger is long though the thumb is short.

It is by his relatively long legs that the adult civilised man most conspicuously differs in proportion from the infant, although not necessarily from the savage, whose legs are sometimes very long; and the leg is that portion of the body which grows most rapidly and to the most variable extent; it is also that part of the body which is most affected by an early arrest of development, although in this the arm also largely participates. The thigh grows with greatest rapidity, and shows also the most decided sexual differences. In women the thigh is markedly shorter than in men; it is larger, and is set at a different angle. As to the greater absolute and relative length of the thigh in men there seems to be no question, although the results of investigation do not show any similar marked difference for the leg, and according to some observers the leg is

[1] W. Pfitzner, in Schwalbe's *Morphologische Arbeiten*, Bd. I, II (1890–92).

[2] S. Weissenberg, 'Die Formen der Hand und des Fusses,' *Zt. f. Eth.* (1895), Heft 2.

[3] *Jour. de l'Anat. et de Phys.*, May–June, 1900.

relatively very slightly longer in women. The greater circumference of the thigh in women is well marked, and begins at a comparatively early age. It is indeed the only measurement of which we can safely say that it is from an early period of puberty onwards both absolutely and relatively always decidedly greater in both European and American women than in men; for although the diameter and still more the circumference of the hips are relatively greater in women than in men, the excess seems greater than it really is, and does not invariably exist, or at all events at so early an age, when we deal with absolute figures. According to the measurements of Quetelet on Belgians, the circumference of the top of the thigh becomes absolutely greater in girls of 14, and is relatively greater than in boys even after the age of 12; while Sargent showed that the thigh of the American girl of 15 is on the average, in absolute figures, two inches larger than that of the American boy of 15. Taking 400 male and female students (fairly representing the average population), of the mean age of 20, Sargent found that the girth of thigh in the women exceeds that in the men by 1¼ inches, and is the only measurement in which the women do absolutely exceed the men.

The large thighs of women, and the corresponding development of the nates, must be regarded as an illustration of the greater accumulation of fat already alluded to, which is a pronounced feminine characteristic. We here encounter a peculiarity in the distribution of fat which is so constant that it may be, and sometimes is, termed a real secondary sex-character; it is chiefly, that is to say, in the thighs and buttocks that the fat in women is accumulated. This is frequently regarded as beautiful, and in some parts of Africa, where it exists in the highly exaggerated form termed *steatopygia*, it is greatly admired.[1] While

[1] As regards the distribution of steatopygia see, e.g., Deniker, *Races of Man*, 93, and Shattock, *Proceedings of the Royal Society of Medicine, Pathological Section* (1909).

in a slight degree this preponderance of fat in the thighs and gluteal regions of women after puberty is to be regarded as normal (although its absence is not incompatible with health and fair general development), it is by no means rare to find women with this full development of the gluteal and neighbouring regions while the upper part of their bodies is almost emaciated. In a marked degree this state constitutes a disorder, almost or quite confined to women, termed *lipodystrophia progressiva*, though it is not necessarily progressive. In this disorder the subcutaneous fat disappears from the face, arms, and trunk, while on the legs and buttocks it remains unaffected or is even increased in amount.[1] It has been argued that living in flat countries (like Holland) increases the size of the hips. This tendency would be chiefly marked in women, because women are more prone to the influences which develop this region.

In woman the thigh, though short, tapers rapidly, and at the lower part it is, absolutely, scarcely if at all larger than that of man; so that while the masculine thigh tends to be columnar the feminine thigh tends to be conical. This characteristic imparts some appearance of instability to the female figure, and the effect is increased by the marked inward inclination of the thighs in women, resulting from the breadth of the pelvis, an inclination which, when it exists in a very marked degree, gives an appearance of knock-knee, and the inward inclination of the thigh is compensated by an outward inclination of the leg. There is an analogous obliquity of the upper extremity; the forearm is never in a straight line with the arm; and this obliquity is also emphasised in women. In 90 women Potter found that the angle of obliquity of the forearm with the upper-arm was 167.35 degrees; in 95 men the angle was 173.17 degrees.[2] But while the lack of straightness in the arm is inconspicuous and conflicts with

[1] F. Parkes Weber, *Brit. Med. Jour.*, 31 May, 1913.

[2] H. Percy Potter, 'Obliquity of the Arm of the Female in Extension,' *Jour. Anat. and Phys.*, July, 1895.

no demand of the eye, since the arms are not normally called to support the weight of the body, it is not so with the legs. This obliquity of the legs is the most conspicuous æsthetic defect of the feminine form in the erect posture, while it unfits women for attitudes of energy, and compels them to run by alternate semi-circular rotations of the legs. In large-hipped civilised women the characteristic is much more obvious than in small-hipped savage women. Artists have adopted various devices to disguise it. It is minimised by toning down the hips and giving to women a comparatively masculine outline, or by the elongation of the thighs and legs; thus the long, straight, and beautiful legs which Tintoret gave to his women almost correspond to heroic canons of proportion which in nature are rarely found in women.

In harmony with the larger size of the thigh, the calf of the leg also appears to be larger in women. Weisbach, on the voyage of the Novara, found that women generally have larger calves than men; the Kanakas were an exception. The lower races generally have a slender calf and they do not admire it when large. The Negroes of the Congo and the Sudan have remarkably slender calves, and exercise has little influence in developing the calves of the lower races. The Japanese and the Polynesians have large calves, but on the whole the large calf is characteristic of the white races, and in them is more easily developed by exercise. Foreign visitors specially note the large calves of women in England and attribute it to the athletic exercises of modern English girls. When (as among the ancient Egyptians) a slender calf appears in one of the higher races it is believed by Bloch to be an atavistic character and indicative of a Negro strain.[1]

The foot has received even more study than the hand, and certain interesting sexual differences emerge. Pfitzner, who studied the foot[2] with the same care as the hand, finds that there are two types of foot: the *elongated* type

[1] A. Bloch, 'La Grossesse du Mollet,' *Bull. Soc. d'Anth.* (1909), 17.

[2] Schwalbe's *Morphologische Arbeiten*, Bd. I, 94 *et seq.*

with long and well-developed middle phalanges, and the *abbreviated* type in which the middle phalanges are short and coarse. The first type is most common in men, the second in women. Which is the more primitive form? We are accustomed, he remarks, to regard women's forms as more primitive, but notwithstanding this he is inclined to look upon the abbreviated type common in women as a more recent acquisition of the race. At the same time he regards the abbreviated form as rather a retrogressive than a progressive evolution; 'no one can look at a middle phalanx of the abbreviated type and not recognise that it is unworthy of any noble mammal, and only to be regarded as a *partie honteuse*.' By their great toes, as well as their thumbs, women are less developed than men; a long great toe and a long thumb are recent acquirements of the race, and they are relatively longer in men.[1] Pfitzner has also made an interesting discovery with regard to the present position and probable future of the little toe. It is well known that while the fingers and toes generally are made up of three bones and are three-jointed, the thumb and great toe possess only two phalanges, and are therefore only two-jointed. Pfitzner finds that there is a tendency for the little toe also to possess only two joints, the middle and end phalanges being welded together. This result is not artificially produced, as it is nearly as common in the embryo and the child as in the adult. There appears, therefore, to be at the present time a progressive, or, as Pfitzner regards it, retrogressive development of the little toe; though it should, perhaps, be added that in such a matter the degeneration only applies to the particular part and not to the organism generally. The course of higher evolution has always been accompanied by the disappearance or degeneration of particular organs and parts which are no longer needed. It is interesting to note that women seem to be leading this movement. Among 111 feet of men

[1] In harmony with its primitive nature, the long second toe is also a fœtal character, as Braune has shown, though it is not, as he thought, invariably so.

and women 41.5 per cent of the women showed fusion of the joint, and only 31.0 per cent of the men. But, as Pfitzner himself remarked, new investigations with a larger number of subjects are needed to confirm this sexual distinction.[1]

The relative length of the big toe and the second toe occupied the attention of Weissenberg when investigating the fingers. He found that in more than half the cases observed (Greeks, Jews, etc.) the big toe was longer, but in Baskirs the second toe tended to be longer. The Greek women had a longer big toe more often than the men, but Jewesses not so often as Jews. In England Park Harrison found that the second toe tends to be longer in women, the big toe in men; in various groups the sexual difference was marked. Papillault found in Paris a very slight excess of women among individuals showing a longer second toe and considers that the best conformed foot has a long big toe. Stratz, on the other hand, believes that the best developed foot shows a long second toe, and there can be little doubt that this is the most beautiful form, as may be seen by an examination of the pictures in the London National Gallery, or any other large collection. The tendency to the greater prevalence in women of a long index-finger thus appears to be accompanied by a similar though less constant tendency to a long second toe. Weissenberg notes that ancient Greek statues usually show a longer second toe, and there are, he observes, æsthetic reasons for such a preference. In Egyptian sculpture (though not in Egyptian statuettes) Weissenberg also found the second toe usually longer; in Assyrian reliefs the big toe is always longer. The Papuans, who tend especially to have a long second toe, would thus appear to approach the classic ideal much more than do modern Europeans. Lombroso at Turin at one time examined various groups of subjects, normal and abnormal, with reference to the point, and found in every

[1] W. Pfitzner, 'Die kleine Zehe,' *Arch. f. Anat. und Phys.*, Heft 1 and 2 (1890). It may be added that ossification of the small bones of the foot is said to begin earlier in girls than in boys, in accordance with the greater precocity of girls.

group that the women showed a larger proportion of shorter big toes than the men. Lombroso's general conclusions on the significance of this variation were, however, faulty, since he was imperfectly acquainted with the results obtained by previous observers.

The question of the relative length of the first and second toes was further investigated in England on the basis of 2300 subjects by Onera Merritt Hawkes who found, like other observers, that the longer great toe is much more common than the longer second toe preferred by artists, and that babies of long second toe type frequently changed to the long great toe type by the age of two years, after which age further changes never took place. While the long great toe type was more frequent in males than in females (89.1 males to 81.9 females), the long second toe type was decidedly more prevalent in females (4.9 males to 11.0 females). An examination of 91 embryos further showed the long second toe in 50 per cent females but in only 41.3 per cent males; and while the longer big toe was found in males of four months it never appeared in females before the fifth month. Women, therefore, seem to tend to be in this respect both nearer to the artist's type of beauty and to the anatomist's primitive or infantile type than are men. This investigator further carried the inquiry into the sphere of Mendelian heredity, and found that the longer great toe type is irregularly dominant over the other type, and that the male heterozygote tends to the longer great toe, the female to the longer second toe.[1]

Ottolenghi and Carrara examined the feet of a large number of persons — men and women, sane and insane, criminals and prostitutes — in order to find out the amount of space between the great toe and its neighbour, and so to estimate the extent to which the individual's foot approaches the primitive prehensile condition. Carefully examining 100 normal men and 62 normal women, they found that the space between the first two toes and the

[1] Onera Merritt Hawkes, *Journal of Genetics*, April, 1914.

power of separating them are much more marked in women than in men; the proportion of well-marked cases being 28 per cent among women and only 11 per cent among men; although the tendency of women to cramp the feet would lead us to expect an opposite result. Among male criminals, prostitutes, epileptics, and idiots there was a still nearer approach to the prehensile condition which is frequent among lower races.[1] I may remark that it is probable that women in ordinary life use their toes more than do men. A lady who has written to me on this point demurs to the statement of Ottolenghi and Carrara that women's shoes, even with the pointed toe affected by women, really interfere greatly with the lateral movement of the toes, while the fact that they are thinner and more flexible than men's boots is also favourable to movement. She notes in herself when standing a tendency to turn the ankles slightly over outwards and to claw down with the toes in an instinctive effort to obtain greater stability. She believes this is common among women both in walking and standing, while women undoubtedly use their toes more than do men in dancing, and she has observed that the heels of women's shoes, especially among the lower class, are often worn down on the outside, but not so often men's. The greater prehensility and flexibility of women's toes may thus, it is possible, while involving the retention of a useful primitive characteristic, be a phenomenon analogous to the greater use of the fingers by women in gesticulation.

In the somewhat bird's-eye view we have obtained in this chapter over a large field of anthropological investigation it has been sufficiently evident that the differences between men and women extend not only to general proportions and laws of growth but to each part of the body taken separately; that, taken in the average, a man is a man even to his thumbs, and a woman is a woman down to her little toes. Three general conclusions clearly emerge: (1) women are more precocious than men; (2) in women there

[1] Ottolenghi e Carrara, *Arch. di Psichiatria* (1892), Fasc. IV, V.

is an earlier arrest of development which it is possible to regard as a preparation for the reproductive life; (3) as a result of these two facts, the proportions of women tend to approach those of small men and of children. This greater youthfulness of physical type in women is a very radical characteristic, and its influence vibrates to the most remote psychic recesses. It is an important factor, but by no means the only factor, in the constitution of secondary sexual differences.

Even in this general sketch of the physical proportions and development of the two sexes we thus already encounter a characteristic which we shall frequently be concerned with: the greater youthfulness of women. There is not much dispute as to the existence of these points of contact with the child on the part of women, which have, since the first publication of the present book, been more especially emphasised by Oskar Schultze, 'Das Weib in Anthropologische Betrachtung' (1906), and by Sellheim, 'Das Geheimniss vom Ewig-Weiblichen' (1911), though Giuffrida-Ruggeri sought to minimise them. The dispute is chiefly concerned with the significance of the fact. For some it is an accidental coincidence of no significance; for others it is a proof of the inferiority of women; for others again, who invoke the child-like qualities of genius, it is a proof of woman's superiority. From the standpoint here taken up, there can be no question of inferiority or of superiority. The youthful characteristics of woman are, as we shall see again and again, highly significant in relation to women's special functions in the world. Yet each sex is at the same time fully developed along its own lines, and the resemblance of man and woman to each other is incomparably greater than any resemblance to the child.

CHAPTER VII

THE PELVIS

The most prominent secondary sexual character — Construction of the pelvis — The pelvis in childhood — The pelvis in relation to the spinal column — The influence of the erect posture in man and woman — Pelvic inclination — The saddle-back — The evolution of the human spinal column — Disadvantages of the erect posture — Women leading evolution in respect to the pelvis.

In the brief sketch of the sexual differences in human growth and proportions presented in the foregoing chapter, no attention has been given to what we may regard, at all events from the present point of view, as the two most important parts of the body. Nothing has been said of the head or of the pelvis. The head is entitled to attention separately, not only as the most visible and generally interesting portion of the body, and the seat of the chief nervous centres, but on account of the great amount of study devoted to it, an amount which to-day we are entitled to consider as even excessive. The pelvis is entitled to a chapter to itself because it constitutes the most undeniable and conspicuous of all the bony human secondary sexual characters. Among numerous lower races, indeed, this is not well marked, and the women of several Central African peoples, for instance, when viewed from behind, can scarcely be distinguished from men; even Arab women, in whom the pelvis (as Kocher and others have described it) is broadly extended, show nothing of the globular fullness of the well-developed European women. An experience of Sir Arthur Keith's illustrates this comparatively greater sexual resemblance in the more primitive races. In reporting on an English prehistoric skeleton, found at Walton-on-the-Naze in Essex, he states that on first seeing it he at once remarked that the skull was a woman's; on turning to the pelvis he found it to be overwhelmingly male; but on final examination he had to go back to his first belief and

conclude that he had before him a narrow-hipped slender woman, for the skull, proportions, configuration of limbs, ribs, and sternum were all characteristically feminine.[1]

We find a comparatively primitive pelvis, which is comparatively masculine in women, among most of the darker races of the earth. Sometimes there are exceptional features for which it is possible to account. Thus in the Philippines, as Acosta-Sison found at the General Hospital in Manila, the Filipina's pelvis is smaller, relatively narrower and deeper, than that of Europeans and Americans, but the transverse diameter of the pelvic outlet is the same as in Europeans; this is attributed largely to the habitual squatting position which the natives assume.[2] But even in Europeans the sexual difference is not invariably pronounced. So experienced an observer as Pfitzner said he could not always recognise the sex with certainty, and Waldeyer considered that there is a special type of masculine pelvis in women, which he termed *pelvis viraginalis*; Hirschfeld would regard this kind of pelvis as belonging to sexually intermediate persons.

The pelvis has thus developed during the course of human evolution; while in some of the dark races it is ape-like in its narrowness and small capacity, in the highest European races it usually becomes a sexual distinction which immediately strikes the eyes and can scarcely be effaced; while the women of these races endeavour still further to accentuate it by artificial means. It is at once the proof of high evolution and the promise of capable maternity. Ancient authorities emphasised this most prominent of all secondary sexual distinctions by saying that while in both men and women the trunk represents an ovoid figure, comparable to an egg, with a large end and a small end, in men the large end is above, in women it is below. That is to say, that in men the diameter of the shoulders is greater than that of the hips, in women the

[1] *Jour. Anth. Inst.* (1912), 128.
[2] Acosta-Sison, *Jour. Amer. Med. Assoc.*, 29 May, 1915.

diameter of the hips greater than that of the shoulders. This statement, as Mathias Duval and others have shown, is exaggerated. The correct formula would be expressed by saying that while in both men and women the trunk is an ovoid, in men the difference between the upper and lower ends is considerable, in women it is slight.[1] Thus Weissenberg found among South Russian Jews that the hip-breadth was 277 mm. to a shoulder-breadth of 362 mm., while in Jewesses there was a hip-breadth of 281 mm. to a shoulder-breadth of 336 mm.[2] But the hips of women are not constantly and everywhere broader than those of men. Thus, as Sargent showed for Americans between the ages of 17 and 20, the women's hips, though relatively 4 inches larger, are absolutely smaller than men's; at the age of 20, girth of hip is in actual measurements one-half inch smaller in women than in men, but if we take men and women of the same height the girth is as much as 6 inches larger in women than in men. The girth of thigh remains the only external measurement that is absolutely and almost constantly greater in women than in men, although its size largely depends upon the relatively great size of the pelvis.

The pelvis — as the bony girdle of the lower part of the body — acts under very different conditions in Man from those found in quadrupeds: In animals it forms an arch which supports the posterior half of the body, while at right angles to its weight-bearing axis the arch is left free to form the gate by which offspring enter the world. This is a most convenient arrangement. In Man the pelvis not only has to support the weight of the whole trunk, but the weight falls in almost the same line as the axis of the exit from the body. The adaptation of the pelvis to the erect

[1] M. Duval, *Précis d'Anatomie Artistique*, 125.

[2] Weissenberg found, moreover, that while in men hip-breadth only increased by 5 mm. between the ages of 20 and 50, in women it increased by 14 mm. Tastewossof (confirmed by Weissenberg) found, among 600 young people up to the age of 20, that from the age of 9 onwards the hip-breadth was notably greater in the girls.

position becomes thus a very delicate adjustment of physical forces, and as this adjustment must be carried to its highest point in women, the pelvis of women is in many respects more highly developed than that of men, which retains more animal-like characters.

Above, the pelvis consists of the hip-bones or ilia, which are in Man broadly spread out and excavated; behind, of that fused portion of the spinal column which is called the sacrum, and which terminates below in the rudimentary caudal vertebræ called the coccyx; in front, of the two pubic bones which meet to form an angle of varying degree; and underneath, of the two ischial bones which support the weight of the body in the sitting posture. All these four groups of bones which constitute the pelvis are differently arranged in man and in woman, and the differences are numerous and well-marked.[1] They may, however, for the most part be easily expressed by saying that while in man the pelvis is long, narrow, and strongly built, in woman it is broad, relatively shallow, and delicately made. It is as though the comparatively primitive and ape-like pelvis of man had been pressed outward by forces acting downward from within, with the object of enlarging the door of life for the unborn child. As often explained by obstetrical writers, the larger pelvis of women is actually due to such a force exerted by the sexual organs which in women are contained within the pelvis. A secondary and accidental result of the broadening and opening out of the pelvis in women lies in the increased size of the thigh and the greater distance between the origins of the thigh-bones, which form such conspicuous characteristics of the female form.

The distance between the iliac crests of the hip-bones in women, although to the eye it appears absolutely greater

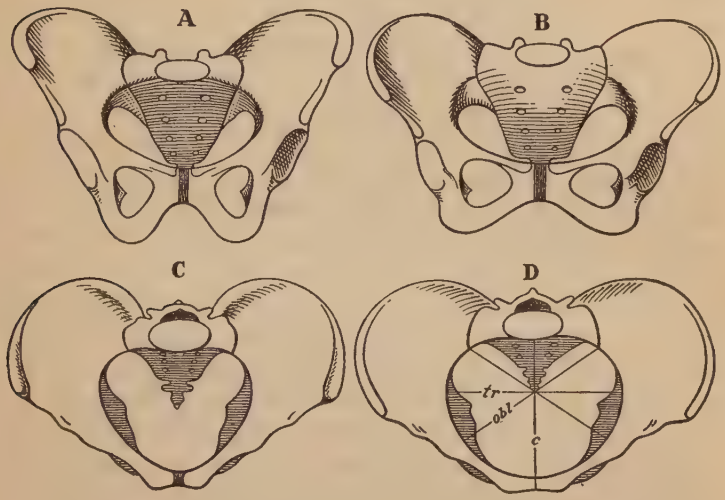
[1] They have been studied in detail by numerous anatomists. The classic work of R. Verneau, *Le Bassin dans les Sexes et dans les Races* (Paris, 1875), may still be consulted. For differences in the pelvis and hips in the women of various races, see the illustrated chapter in Ploss, Bartels, and Reitzenstein, *Das Weib*, Bd. I, 'Das weibliche Becken in anthropologisches Beziehung.'

than in men, is, as we have seen, usually only relatively greater, but absolutely smaller; the breadth of the upper opening of the pelvis is, however, both relatively and absolutely greater in women, both in the higher and lower human races. Sergi has taken advantage of the fact to devise an ilio-pelvic index, formed by multiplying the transverse diameter of the pelvic brim by 100, and dividing by the distance between the iliac crests. This gives, on the basis of Verneau's data, for European men an index of 46.5 and for women 50.8. By measuring pelves from all parts of the world, Sergi found that the ilio-pelvic index is almost invariably greater in women than in men, differences in race appearing to produce little change in this index.[1]

Sexual differences in the pelvis become marked, according to Fehling, as soon as the bones begin to ossify, or in the fourth month.[2] Fehling's conclusions have been confirmed by Professor Arthur Thomson of Oxford, who finds such differences discernible from the third month. In a very detailed and fully illustrated paper on this subject he gives photographs showing that the pubic angle is from the fourth month onwards perceptibly larger throughout in the female, and concludes that 'during fœtal life the essentially sexual characters are as well defined as they are in adult forms, and that any differences that occur during growth between the adult and fœtal forms, due, it may be, to the influence of pressure or muscular traction, affect both sexes alike, and that such influences are in no way accountable, as has been maintained, for the characteristic features of the pelvis of the female as contrasted with the male.' [3] At birth, Romiti found sexual differences distinct, more especially as regards greater breadth of the subpubic arch, less height of pelvis, and less straight ilia in the female.[4] Jürgens, who studied the pelves of 25 boys and 25 girls under the age of five, found that those of the girls were

[1] Sergi, *La Clinica Ostetrica*, Fasc. III (1899).
[2] *Archiv. f. Gynäk.*, Bd. X (1876).
[3] Arthur Thomson, *Jour. Anat. and Phys.*, April, 1899.
[4] G. Romiti, *Atti della Soc. Toscana di Sci. Nat.*, VIII (1892).

markedly larger, especially in the transverse diameter.[1] Le Damany found that in the white race the antero-posterior thickness of the trunk at the anterior superior iliac spines is notably greater in new-born female infants than in males; this depends on sexual differences in the pelvis, and is regarded by Le Damany as the only notable sex differ-



A. MALE PELVIS FROM FRONT; C, FROM ABOVE. B. FEMALE PELVIS FROM FRONT; D, FROM ABOVE (*Gegenbaur*)

ence at birth.[2] While sexual differences thus appear at the earliest age, the infantile pelvis in its general aspects is long, narrow, and straight, thus approximating to the pelvis of the higher apes and the lower human races, such as Kaffirs, Australians, and Andamanese; in European children also, as Litzmann has shown, the transverse diameter of the pelvic brim closely approximates to the antero-posterior diameter, a characteristic of the lower races, while in adult Europeans the transverse diameter much exceeds

[1] *Rudolf Virchow Festschrift* (1891).
[2] P. le Damany, *Jour. de l'Anat. et de la Phys.* (1910).

the antero-posterior, and in women more than in men. In nearly all respects the adult woman's pelvis is in more marked contrast to the infant's than is the adult man's; all the lower parts are opened out instead of compressed, the ischial spines especially being widely separated. If we compare the breadth of the pelvis to its length, as Topinard has done on a large scale to ascertain the 'pelvic index,' we find that with vertebrate evolution from the lower animals to European man the pelvis has constantly been becoming broader in relation to its length, and that in women the pelvis is always broader in relation to its length than in men. 'As we rise in the human series,' Topinard concludes, 'the pelvis enlarges, and consequently the supremely beautiful pelvis is an ample pelvis. The Greeks, by narrowing the pelvis in their sculpture, not only deprived woman of one of her most deserved characteristics, but made her bestial.' [1] In this matter, therefore, we may say that women lead in evolution and men follow, the European male pelvis, as Manouvrier pointed out, being 'comparatively feminised' as compared with the Negro male pelvis.

By the breadth of her sacrum, also, woman shows a higher degree of evolution than man. The sacrum in apes and in the lower human races is long, straight, and narrow, in harmony with the rest of the pelvis; the sacral index which expresses the degree of breadth of the sacrum shows a progressive rise from Hottentots to Europeans which culminates in European women.[2]

An external indication of the size of the pelvis may probably be found, as Stratz has pointed out, in the lozenge-shaped space on the surface of the sacrum which

[1] Topinard, *Anth. Gén.*, 1049–50. Some of the points here noted are illustrated and further developed in a 'Comparative Study of White and Negro Pelves' (*Johns Hopkins Hospital Reports*, XII, 1904) by T. F. Riggs, who also considers the size of the child (1 to 2 cm. larger and 200 grs. heavier in white races) and the character of labour in the two races.

[2] The evolution of the female pelvis and its departure from the male type is well shown by Garson's carefully prepared diagrams of the typical Andamanese and European pelves. (See figures on page 175.) They are constructed from the average dimensions of 13 Andamanese and 14 European female pelves.

has been called after Michaelis. This space is formed laterally by two dimples corresponding to the superior posterior iliac spines, above by another dimple usually

AVERAGE ANDAMANESE FEMALE PELVIS
(*Adapted from Garson*)

AVERAGE EUROPEAN FEMALE PELVIS
(*Adapted from Garson*)

situated at the spinous process of the last lumbar vertebra, and below by the point at which the gluteal fissure begins. In men the lateral dimples, if found at all, are several centimetres nearer to each other.

Stratz, who has fully discussed this region, considers that these sacral dimples are secondary sexual characters scarcely inferior to the breasts in importance. This can scarcely be admitted, though, on the other hand, Brücke

and Waldeyer have gone too far in denying that they are a sexual distinction at all. In all youthful and well-nourished women these dimples are large and deep, and the enclosing space well defined. Various ancient authors refer with special admiration to these dimples, as a feature of feminine beauty, comparing them to the dimples of the face. In men they are much less marked, and, according to Stratz, only occur in from 18 to 25 per cent cases.[1]

We may gain a somewhat deeper insight into the problems that are grouped around the pelvis if we consider it in relation to the spinal column, and more especially in relation to the various forces which influence or modify the adoption of the completely erect position. The erect attitude, as Elliot Smith remarks, is not merely a question of balance, but (as Keith has shown) entails profound structural changes for the fixation of the contents of the body, so that the organs may not tend to fall; with the loss of the tail, the tail muscles are used as visceral supports, while the arms, previously acting as fixed supports for the muscles of respiration, are freed, the diaphragm now taking the chief place for this function. The modern gibbon, a true anthropoid, still preserves, with only slight change, the type of the ancestor of the common stock from which sprang both Man and the giant apes.[2]

Verticality, as Delaunay pointed out,[3] is in direct ratio with evolution and nutrition, while horizontality is in inverse ratio. The apes are but imperfect bipeds with tendencies towards the quadrupedal attitude; the human infant is as imperfect a biped as the ape; savage races do

[1] C. H. Stratz, *Arch. f. Anth.*, Bd. XXVII (1900), 122; Ploss, *Das Weib*, with numerous illustrations, Bd. I, 312–18.

[2] *Report Brit. Assoc.*, 82 (1912), 589.

[3] *Études de Biologie Comparée*, 1e Partie; also Frank Baker's presidential address to the Anthropological Section of the American Association for the Advancement of Science (1890) on the ascent of man to the erect position and the consequent modifications his body has undergone. P. le Damany (*Jour. de l'Anat. et de la Phys.*, 1905, no. 2) discusses the various changes which have taken place in the spinal column, the pelvis, and the femur, as a result of the effort to overcome the difficulties of the upright position in man.

not stand so erect as civilised races. Country people (even apart, according to Delaunay, from agricultural labour) tend to bend forward, and the aristocrat is more erect than the plebeian. In this respect women appear to be nearer to the infantile condition than men. 'It has been observed among the natives of Ceylon,' remarks Delaunay, 'that the women are more curved forwards than the men. In our European societies it is easy to see that women generally do not hold themselves quite upright and walk with the body and head bent forward.'

Manouvrier points out that, at the same time, a truly erect position may be maintained even with varying relations of the femur, tibia, and astragalus to each other, varying degrees of curvature in the spinal column acting as the compensatory influence. Thus verticality may be perfect without complete extension of the thigh on the leg, and such verticality has the advantage of being attained with diminished muscular effort. There are, however, limits to the advantages of such adjustments of verticality, and it would appear that the opposed and equally unsatisfactory extremes of mal-adjustment of verticality are common among civilised women. Dickinson and Truslow, from the examination of a large number of American women,[1] find that the average civilised woman sags: her breasts drag down, the buttocks sweep low, and the abdomen protrudes. There are, they conclude, two opposed types of defect: the *kangaroo type*, in which the upper part of the trunk is carried in front of the line of gravity and the lower part of the trunk behind it, and the *gorilla type*, in which the reverse is the case. Both attitudes lead to pain and strain.

Normally the carriage of the human female to any careful observer has (except during pregnancy) a sinuous character and a forward tendril-like movement which is full of charm, and contrasts with the more proud and

[1] 'Attitudes and Trunk Development in Women,' *Jour. Am. Med. Assoc.*, 14 Oct., 1912.

rigid, almost convex, carriage of the human male. The head tends to fall forward, and that this tendency is not due to training seems to be shown by the fact that it has an anatomical basis, as was pointed out by Cleland. From childhood onwards the skull is slowly tilted more and more backwards in order to throw more and more of the weight behind. 'The female skull,' Cleland remarks, 'is much less tilted back than the male, being in this, as in various other respects, more child-like than the male skull.' [1] While the head is more tilted forward in women, the pelvis is more tilted back. This is due to partial arrest of an infantile character. The angle formed by the superior plane of the pelvis with the horizon when standing is about 70° to 80° in the infant, 50° to 55° in men, 55° to 60° in women. (Papillault's method of measurement gives a wider angle, but a similarly large sexual difference.) This inclination — which tends to efface the mons Veneris between the thighs and to give an abdominal curve often adopted by artists — better supports the pelvic contents. In animals it appears there is also a sexual difference; thus in the horse the angle is said to be 110°, in the mare 120°. There is some reason to suppose that when the angle in women is very little inclined (from 24° to 45°) there is a tendency to uterine prolapse. The racial differences are considerable; thus in Mexican women, whose pelvis is in many respects remarkable, the average inclination is from 61° to 65°.

The differences in gait of men and women, associated with anatomical differences, were studied by Fränkel of Berlin who illustrated them cinematographically. Women walk in a more swaying manner, and Fränkel found that, in relation to the double and single support on the feet, in men 30 per cent of the half-step is on the double support, and in women only 20 per cent.[2]

In harmony with other pelvic distinctions, the anus ap-

[1] Cleland, 'The Variations of the Human Skull,' *Philosophical Trans. Roy. Soc.*, 1870.

[2] Fränkel, *Zt. f. Orthopädische Chirurgie*, Bd. XX (1908).

pears to be rather farther back and nearer to the coccyx in women than in men; in the apes (and also to some extent in the child) there is a comparatively long distance between the tip of the coccyx and the anus. In some African races, even (according to Delaunay) among the Moors, the vagina is often so far directed backwards as to render necessary the quadrupedal method of congress. The older anthropologists used to judge of the inclination of the pelvis by the direction of the urinary stream in the female. A stream directed backward is an animal-like character rarely found, even in the lower races; a forward direction of the stream indicates a high degree of the distinctively human upright position.

An anatomical explanation has sometimes been given (i.e., by Wernich in the case of the Japanese women) for the primitive attitude of women during urination. This attitude is for both sexes the opposite of the civilised; i.e., men squat, the women stand. This was the custom even in ancient Egypt (according to Herodotus); it was also the custom in ancient Ireland (according to Giraldus Cambrensis); it was almost universal in America. There is no reason, however, to suppose that anatomical considerations come in here to any marked extent; it is partly a psychological, partly a ritual matter, partly a question of clothing. In most countries the habits of the sexes in this matter are opposed, and as a general rule, also, the practice of the more civilised countries is the reverse of the primitive practice. The general tendency of modern civilisation to approximate the sexes, however, is evident in this matter also.[1]

The inclination of the pelvis is related to, though it is not identical with, the saddle back or lumbo-sacral curve which in its exaggerated pathological form is called lordosis. This is only slightly marked in the ape, and does not exist in the human embryo. It is one of the superior qualities of African races, and appears to be increased by

[1] See Havelock Ellis, *Studies in the Psychology of Sex*, VII, 392–99.

MALE SPINAL COLUMN SHOWING THE NORMAL CURVES IN THE UPRIGHT POSTURE (*Panch*)
In women the convexity forwards below the first lumbar vertebra is increased

the muscular action of the back, as in rowing upright and in carrying children on the hips. It is more pronounced in women than in men, as Duchenne first showed, and is especially well marked in Spanish and Creole women, constituting the main anatomical basis to their beauty of carriage.[1]

In the Punjab women, it is said the lumbar spine is more convex than in the male. The same is probably more or less true of all European women. It has been attributed to the influence of pregnancy, having the same effect on the woman's body as carrying the big drum has on a man's.

Cunningham's lumbo-vertebral index shows the tendency to curvature; a high index indicates — though not invariably — a low curve, and a low index a high degree of curvature. In the chimpanzee the index is 117, in the Australian 108, in the male Andaman 106, in the female Andaman 105, in Negroes 105, in Europeans 96, in (21) Irish males 96.2, in (22) Irish females 93·5. (An index below 100 means that the anterior measure-

[1] Art. 'Ensellure,' *Dict. des. sci. Anthrop.*

ments of the lumbar vertebræ exceed the posterior.) So that curvature increases on the whole as we ascend the scale, and tends to be greater in women. Among North American Indians, who have a medium lumbar index, Dorsey has found that the sexual difference is marked and constant.[1] Luschka, Balandin, Charpey, Ravenel, all consider that the lumbar curve is most marked in women. Charpy pointed out that the degree of the curve is in proportion to the inclination of the sacrum, and this is confirmed by Papillault, who points out that the prominence of the buttocks in relation with this sacral obliquity is an index of functional utility. As sacral obliquity may be due either to an acute sacro-vertebral angle or to a pronounced lumbar curve, Papillault remarks that we have two different types which may possibly be of racial significance.[2]

In association with this greater curvature we find, if we compare the bony spinal column of man with that of woman, that the chief difference is the relatively greater length of the lumbar region in woman. In woman also the curve seems to begin higher and to attain its summit at a higher point. This is a character which in association with the greater relative size of the abdomen fits woman for her maternal function. While in women the lumbar region constitutes 32.8 per cent of the entire column, in men it constitutes only 31.7 per cent; [3] and, on the other

[1] G. A. Dorsey, *Bull. Essex Inst.*, XXVII (1895, Salem, Mass.).

[2] In this connection see P. le Damany's study of 'L'Angle Sacro-Pelvien' (*Jour. de l'Anat. et de la Phys.*, 1906 and 1909). This sacro-pelvic angle (formed in the median plane of the body by the ventral face of the sacrum with the pelvic ring) is larger in higher than in lower races, and in women than in men. Le Damany finds that occupation is more influential than sex in modifying the sacro-pelvic angle. The increase of the angle is due to the rise of the sacrum and this he regards as affected by the action of the lumbar muscles. It occurs in hard work and the carrying of heavy weights. The harder a woman works the greater the sacro-pelvic angle, and as in civilisation men work harder than women there is a tendency for the sacro-pelvic angle to be larger in men than in women. Le Damany cannot agree with Charpy that pregnancy raises the sacrum and increases the lumbar curve.

[3] These are the figures given by D. J. Cunningham, who carefully studied the relations of the spinal column in the *Cunningham Memoirs* of the Royal Irish Academy, no. 2, 1886, and *Jour. of Anat. and Phys.*, Oct., 1888. G. A. Dorsey, who has studied the lumbar index in American Indians, finds it an important sexual distinction, as well as a test of racial superiority.

hand, the dorsal section of the column is 46.5 in men against 45.8 in women. The lumbar region of the column is thus not only longer in women than in men, but it is moulded on a different plane, being more arched and the vertebræ moulded more distinctly in adaptation to this arch. 'All these distinctions,' Cunningham believes, 'may be accounted for by the different habits pursued by the two sexes. There is no part of the vertebral column which is more readily moulded by the functions that the spine has to perform, because it is that section of the column which works under the greatest degree of super-incumbent pressure.'

Soularue, by the method of measuring the anterior face of each vertebra separately, found the same relatively greater length of the lumbar vertebræ and ascertained that it applied also to the lower dorsal vertebræ. The difference was almost equally great in Europeans, Mongols, American Indians, and Negroes. Soularue found that the sacrum is very slightly larger and also more curved in men; in Mongol and American Indians, however, it was relatively larger in women.[1] Papillault, while admitting the relatively greater size of the lumbar vertebræ in women, finds that it is compensated by less development of the intervertebral cartilages. Rosenberg[2] from his researches into the development of the spinal column came to the conclusion that it is shortening in Man. The ancestral form, he considered had 25 movable vertebræ anterior to the sacrum; now there are 24; in the future there will be only 23. In this connection he pointed out that on the transverse process of the first lumbar vertebra of the fœtus is found the cartilaginous rudiment of a rib which subsequently disappears through its fusion with the transverse process, suggesting that the ancestral type was a condition now most frequently found in the gibbon, 13 ribs and 25 movable vertebræ. This ancestral type is sometimes found

[1] Soularue, *Bull. et Mém. Soc. d'Anth.* (Paris, 1909).
[2] *Morphologisches Jahrbuch* (1876).

in Man at the present day. Ambrose Birmingham supported Rosenberg's view, and Wiedersheim, also supporting it, remarked that the spinal columns with the most reduced number of vertebræ always occur in women, so that women in this respect would be leading the evolutionary movement, a supposition in harmony with the higher morphological development of the pelvis in women. Paterson [1] could not accept it, on the ground that there is more often elongation than contraction of the region above the sacrum; but his facts and arguments, as contained in the abstract published by the Royal Society, do not clearly support his objection, and he admitted that a process of fusion is going on at the caudal end of the column. The question was later discussed by D. J. Cunningham, who disputes Paterson's views and leans towards Rosenberg's.[2] He believes that the lumbo-sacral region of the spine, which is in a position of very unstable equilibrium, may exhibit both retrospective and prospective variations, and points out (as against Paterson) that statistics alone do not suffice to show the direction of the movement; a prospective or prophetic variation can at first make little way against the strong counter-current of normal and atavistic tendencies, so that a long period must elapse before it wins its way to a high place on the statistical table. If we suppose, Cunningham argues, Man and the anthropoid apes to be descended from a gibbon-like ancestor with at least 26 præsacral vertebræ, we find that Man has 25, the gorilla and the chimpanzee 24, and the orang 23. The orang has thus travelled farthest on this line and reached its goal, for it exhibits comparatively few variations. Man and the gibbon are lagging behind, though they have made considerable progress along the same path. Cunningham adds, though not as an argument having any anatomical value, that the æsthetic taste

[1] *Proc. Roy. Soc.*, 1892.

[2] 'The Significance of Anatomical Variations,' *Brit. Med. Jour.*, 10 Sept., 1898.

of man emphatically condemns a long trunk with short legs.

If woman's body seems to be somewhat more reminiscent of the quadrupedal posture than man's, she has excellent reason for it. It is probable that, as Baker shows, in both sexes various pathological and unwholesome conditions have been encouraged or produced by the erect posture; it is sufficient to mention hernia, stone, disease of the vermiform appendix of the intestine, varicose veins, exposure of the great arteries to injury, torpidity of gall-bladder, greater constriction of lungs and therefore inability to sustain prolonged and rapid muscular exertion, disorders of the liver from the difficulty of raising blood through the ascending *vena cava*, and the tendency to syncope. Women share these disabilities with men, but in addition they suffer other special disadvantages. The erect position has comparatively slight effect on man's sexual organs, beyond producing a predisposition to scrotal varicosity and greater exposure to injury; it tends very seriously to affect woman's sexual organs, and enormously interferes with the maternal functions. 'In the quadruped,' Baker remarks, 'the act of parturition is comparatively easy, the pelvis offering no serious hindrance. The shape of the female pelvis is therefore the result of a compromise between two forms — one for support, the other for ease in delivery. When we reflect that along with the acquirement of the erect position the size of the head of the child has gradually increased, thus forming still another obstacle to delivery and to the adaptation which might otherwise have taken place, we can realise how serious the struggle has been, and no longer wonder that deaths in childbirth are much more common in the higher races, and that woman in her entire organisation shows signs of having suffered more than man in the upward struggle. In no other animal is there shown such a distinction between the pelvis of the male and that of the female — a distinction that increases as we ascend the

scale. . . . The frequency of uterine displacements, almost unknown in the quadruped, has also been noted, and it is significant that one of the most effective postures for treating and restoring to place the disturbed organ is the so-called "knee-elbow position," decidedly quadrupedal in character.'[1]

It is common to speak, as Baker does, as though Man were a quadruped which had suddenly become a biped by standing on his hind limbs, but it is scarcely necessary to say that that is merely a convenient method of expression. It was only by a slow and gradual process that the ancestors of Man acquired the upright attitude. There can be little doubt that this took place during the long period of arboreal existence which the anthropoid apes still largely mantain. 'No ordinary quadruped was turned through a quarter of a circle into the vertical plane,' remarks Professor Wood Jones, who has written an interesting book on this subject. 'But some extremely primitive Mammal climbed a tree, lived and lodged among its branches, and after long ages walked to earth again as that Primate destined to be the dominant member of the animal kingdom.'[2] Wood Jones considers that the advantages and disadvantages of the erect attitude have been exaggerated. But this is a question in regard to which the conclusions of the biologist, however sound for the majority, must be qualified by the experience of the surgeon and the obstetrician.

Even the biologist, however, may well hold, with Professor Mackenzie, the Director of the National Museum of Australian Biology, that 'on the erect attitude depends

[1] The advantages of this posture in the treatment of the diseases of women have been summarised by Dr. Potter of Buffalo, who considers that its discovery by Marion Sims was 'the turning-point in the history of gynecology' ('Posture in Obstetrics and Gynecology,' *Trans. Am. Soc. of Obstet. and Gynec.*, V, 1893, pp. 99–102). Sir Arbuthnot Lane ('Civilisation in Relation to the Abdominal Viscera,' *Lancet*, 13 Nov., 1909) also emphasises the evils of the erect position, especially in women. He considers they may be to some extent compensated by methods affording support to the lower abdomen, leaving the upper abdomen free.

[2] F. Wood Jones, *Arboreal Man* (1916), 224.

human intelligence.' The possibilities of attack and defense are enormously increased. The hand, with its infinite uses, is free to be developed. The horizon is extended. Vision and hearing are improved; and with them, memory develops. The possibilities of signalling are enlarged, and speech arises. Mackenzie refers to the immediate improvement in mental outlook of paralysed children when they are raised to the erect position by mechanical or operative means. But every system of the body is affected by the change, and we cannot be surprised that in some respects the modifications necessary have been difficult and perilous. Even to-day the erect attitude cannot always be long maintained, and by primitive peoples nearer to the earlier state still less than by the higher races.[1]

We can scarcely doubt, indeed, that the adoption of the erect position has — to use the convenient teleological method of expression — placed Nature in an awkward dilemma. Thus, as regards the region we are here concerned with, on the one hand it is necessary for the stability of the body and the due support of the organs that the pelvis should be tough, that the bony girdle should be strong and hard, and the inner channel small. On the other hand, for the higher evolution of the race it is necessary for the bony girdle to be rendered somewhat less stable by the increased size of the outlet which will permit the birth of large-headed children. The most delicate adjustment is required to prevent these directly opposite necessities from conflicting with each other.[2]

[1] W. C. Mackenzie, *Brit. Med. Jour.*, 22 Sept., 1928.

[2] The difficulty of this adjustment is shown by the cases, occasionally occurring, of congenital diastasis of the symphysis pubis. In such cases there is increased pelvic elasticity, and the pelvic ring tends to gape at the pubis. The result is (as in a case recorded by Schauta, *Centralbl. f. Gynäk.*, Aug. 1899) that labour is easy, quick, almost painless, and without bad results. But, on the other hand, additional care and artificial support are required during pregnancy. In some animals this relaxation of the pubic ring during pregnancy is normal. Thus it has been found by Stirling (*Brit. Med. Jour.*, 13 Sept., 1902), that in the guinea-pig, which is born in a relatively mature condition with a large head, the bones of the pelvis become extraordinarily movable during pregnancy, the ligaments relax, and there is a gap at the symphysis.

If we were born through the navel (as some of us supposed when we were children) the dilemma would not exist; but while such a method of parturition would be in perfect harmony with the biped position, it would have been impracticable in the quadrupedal position. On the whole, as we know, while the adjustment is not absolutely perfect and we suffer from the disadvantages of the biped position, the demands of the higher evolution of the race have caused, and will no doubt continue to cause, an increased expansion and development of the pelvis, a movement in which women are the natural leaders. But the children always tend to be somewhat too developed for the gate by which they enter the world; this cunningly contrived girdle of bone is a force on the side of mediocrity, shutting out the highly developed from the chances of life, although it is a force which tends to become weaker, for the size of the head depends on both parents, and the women with small pelves tend to produce stillborn children or weak children unlikely to survive, and so it is not easy for them to transmit their small pelves. In the higher evolution of the race the increased development of the head must always be accompanied by the increased development of the pelvis.

CHAPTER VIII

THE HEAD

The skull — In the infant — Chief cause of sexual differences in skull — Early opinions — The three chief sexual differences in skull — Minor differences — The cephalic index — The face — Sexual differences in facial development — The eye — The facial angle — The lower jaw — The teeth — Cranial capacity — Sexual differences in frontal, parietal, and occipital regions of skull — Man's skull approaches the senile, woman's the infantile type.

The brain — Differences in brain-weight — Among the insane — The standards of brain-weight — Height and weight — Fallacies — Women's brains proportionately larger than men's — Advantages and disadvantages of a large brain — Sexual differences in the evolution of the brain — Sexual differences in the frontal, parietal, and occipital regions of brain — Blood-supply of brain — The cerebellum and other centres below the cerebrum — Definite results of study of sexual differences in the brain at present small.

The study of the pelvis naturally brings us to the study of the head with which it is in such intimate relation. In studying the head we may first of all consider the *skull*, unimportant in itself as being merely the comparatively inert garment of the living brain, which to some extent it moulds, and by which, to a large extent, although not in detail, it is itself moulded; at the same time we will glance at the interesting but as yet not greatly cultivated study of the face; then we will turn to the *brain*, unquestionably an organ of the first importance as being a collection of the chief nervous centres which are probably more or less concerned in every process that goes on in the organism, but unfortunately an organ which does not easily lend itself to study.

THE SKULL

If we take up the skull of an infant we find that it is very light and very smooth, with thin, translucent walls delicately veined by the blood-vessels. The orbits appear large; the lower jaw is small and shallow, and its angles very wide; the face, taken altogether, is relatively small.

The parietal bones are very large, forming the greater part of the roof and a large part of the walls of the skull, and each parietal bone presents a well-marked boss, the resultant of mixed compressive forces, which gives the impression that the skull is not yet fully expanded. The other bones are mostly in a very undeveloped condition, and their component parts are still incompletely welded together. The bony processes and corrugations, which afterwards give a foothold to powerful muscles to support or turn the head, can scarcely be traced at all. We notice, further, that the hole through which the spinal cord emerges to enter the spinal column is placed very far back, so that when supported at this point of junction between the head and the body the head tends to fall forwards.

There would be no difficulty whatever in recognising an infantile skull even if it were magnified to adult proportions. But it is another matter when we turn from age distinctions to consider the sexual characters in an adult skull. Some investigators, though not in recent days, have gone so far as to declare that there are no sexual differences in the skull except size.[1] And most competent craniologists insist that, among non-European races, it is often difficult to determine the sex from the skull, as the criteria furnished by one race do not hold for other races, although among some savage races (as in New Britain) the sexual differences in the skull may be 'colossal.' When attempting to determine by inspection alone the sex of skulls of known origin, Mantegazza, an experienced anthropologist, found that his mistakes were from three to five per cent; Rebentisch, a younger and less experienced observer, found that his errors were nine per cent.

[1] But Jacobæus of Copenhagen, who in 1709 wrote a book, *De Distinguendis Cadaveribus per Crania*, showed that there were some sexual differences in the skull. Barnard Davis and Thurnam (*Crania Britannica*, 1856–65) seem to have been the first to recognise the necessity of always separating the sexes in craniometrical tables. Important studies were embodied in two inaugural dissertations: E. Rebentisch (Strassburg), 'Der Weiberschädel,' (*Morphologische Arbeiten*, II, 2, 1893), and Paul Bartels (Berlin), *Ueber Geschlechtsunterschiede am Schädel* (1897), as well as in several volumes of *Biometrika*.

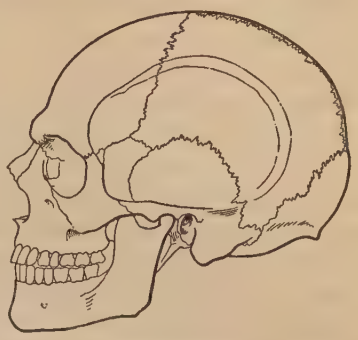
The skull is of incomparably less importance from this point of view than the pelvis. And although it is impossible to assert that differences between the skulls of men and of women are only those of size, it is extremely probable that, as Manouvrier argued, such sexual characters as may be found are due mainly to the differences in general physical proportion; that is to say, that they depend chiefly on the greater precocity of woman and her earlier arrest of growth. There is no absolute sign by which a male or female skull can be recognised.

Panichi has shown by his observations on the skulls of children at Florence that sexual differences begin to be visible at the age of six, and that most of the chief sexual distinctions are fairly well marked before the age of twelve.[1] As to what the most constant sexual differences, taken comprehensively, are, it cannot be said that any two authorities are quite agreed, for each craniologist has his own preferences, and we have to bear in mind that sometimes a skull may be masculine in some of its characters, feminine in others; while a man's skull may approach a woman's in character, or (more frequently, in Mantegazza's experience) a woman's skull may resemble a man's. There is no one constant sexual character in the skull, but there are a few characters which, when taken together, unmistakably indicate its sex:

(1) Perhaps the most conspicuous and distinctive of all the characteristics of the male human skull is the prominence of the glabella (or bony projection over the nose) and of the supraciliary ridges; that is to say, that men have overhanging brows which are little marked in women, while they do not exist in children; they develop at puberty and increase with age, and form a distinctly retrogressive character, being exaggerated in many lower races and to an extreme extent in the anthropoid apes. Associated with these bony prominences in men are large frontal air-sinuses which in women are much smaller.

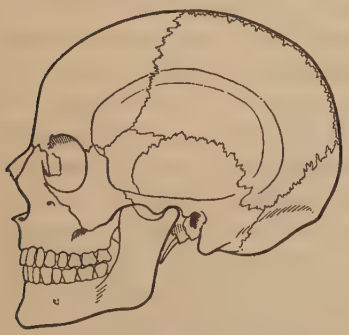
[1] R. Panichi, *Arch. per l'Antrop.* (1892), Fasc. I.

(2) In women certain bosses which are prominent in children have usually persisted to a more marked extent than in men; these are the parietal bosses at the outer and upper part of the back of the head and the frontal bosses half-way up the forehead over the eyes; in men these present the appearance of having been largely obliterated by the expansion of the skull.



TYPICAL MALE SKULL (*Poirier*)

(3) All the muscular prominences are better marked in men, and the bones of the skull generally are thicker and stronger; thus the inion (the small occipital protuberance at the back of the head) is nearly always larger in men, as are the mastoid processes beneath the ear, which in children are very small.



TYPICAL FEMALE SKULL
(*Poirier*)

The ridges on the skull for the attachment of muscles are also more marked in men. With regard to these three points it may be confidently said that there is very general agreement among anatomists. There are other sexual distinctions which seem to be fairly well marked but which are less obvious: thus in women the top of the head appears to be flatter, and at a more marked angle with the straight forehead, while in men the curve from before backwards is more smooth and even — a distinction insisted upon by Ecker and Mantegazza, and recognised by the Greek sculptors; women's skulls, also, in most races, are relatively

shallower than those of men, in dependence on the greater flatness of the head; in women, again, while the base of the skull is usually smaller than in men, the arch of the skull, measured from the base of the nose to the occipital foramen, is often as large as in men.

These characters have not the same definiteness or constancy as the three characters first mentioned. The lowness of the female skull, which is accepted by Welcker, Weisbach, Ecker, Cleland, and Benedikt, seems to be due to the persistence in women of the infantile character of flatness of the roof; at birth the male and female skulls are of equal height, but the female skull in its adult shape lacks the final increments of height gained by the male. There are, however, many races, both prehistoric and modern, among whom the skull is not lower in women than in men. The relation of the arch of the skull to its base (the direct line between the two ends of the arch) was worked out for various races by Cleland in his interesting paper on 'The Variations of the Human Skull,' in the 'Philosophical Transactions of the Royal Society,' for 1870. In infancy and childhood the base is very small compared to the arch; in women the base is almost always short, while the extent of the arch is in some instances as great as in the male. Comparing races, the Irish have the largest proportion of arch to base, the Chinese next. The short base line of women is therefore an infantile character, but on the other hand the longer base line of man is a savage character. 'The most striking and altogether remarkable fact,' Cleland pointed out, 'is that in uncivilised nations, while the length of the arch is very variable, the length of the base line is always great.' Here, as is so often found, the infantile condition indicates the direction of evolution.

CEPHALIC INDEX

A very great amount of study has been expended on the cephalic index, especially in regard to race and to sex. In regard to race, the great value of this index is unques-

tioned;[1] in regard to sex, although the assertions of craniologists have been equally emphatic in opposite directions, its value is by no means so clear. This index, which was devised many years ago by Retzius and perfected by Broca, shows the relation of the breadth of the skull to its length; it is ascertained by multiplying the maximum transverse diameter by 100, and dividing the result by the maximum antero-posterior diameter, certain precautions being observed in taking the measurements. A head or a skull of which the cephalic index is from 70 to 74 is usually called dolichocephalic; from 75 to 79 it is called mesaticephalic; from 80 to 84 brachycephalic; below 70 it is hyperdolichocephalic; and above 84 it is hyperbrachycephalic. Therefore, the more an individual is relatively broad-headed the higher is his cephalic index, and long-headed persons have a low cephalic index. While some anthropologists (like Deniker in his 'Races of Man'), realising that the differences are in any case slight, are content with the conclusion that there are no important sexual differences in this respect, a large number of other distinguished anthropologists, like Welcker and Broca, have asserted that in Europe women are more dolichocephalic than men, that is to say, that women's heads tend to be rather longer or not so broad. But, on the other hand, other eminent anthropologists, like Mantegazza and Topinard, find that women are more brachycephalic than

[1] Sergi (*Specie e Varietà Umane*, 1900, and *Mediterranean Race*, 1901) has shown the importance of studying the skull by a zoölogical method based on form, but the cephalic index, when used with discretion, still retains much value. It must be added that in recent years doubt has been thrown on the absolute racial stability of head-shape as indicated by the cephalic index. Fishberg (*The Jews*, Contemporary Science Series) has shown that the cephalic index of the Jews in Europe tends to approximate to that of the race they live among, and he attributes this to some degree of mixture with the surrounding people. But Boas found (*Changes in Body Form of Descendants of Immigrants*, Reports of United States Immigration Commission, 1911) that the children born in the United States of Jewish immigrant brachycephalic parents tend to become progressively more long-headed in successive births, while the children of dolichocephalic Sicilians tend to become progressively more broad-headed. This would show a power of the environment hitherto unsuspected.

men. In England Crochley Clapham gave the measurements of nearly 2000 insane men and about the same number of insane women;[1] he also examined a much smaller number of normal men and women; calculating the cephalic index from the figures given by Clapham, I find that for insane males it is 80.3, for insane females 80.1, for sane males 81.2, for sane females 80.5; that is to say, that the sane are slightly more brachycephalic than the insane, and the men very slightly more brachycephalic than the women.

If we turn to consider the cephalic index among human races generally, the discrepancy continues equally great. Among a large number of races, ancient and modern, the men are more brachycephalic than the women. Among a yet larger number of races, on the other hand, the women are more brachycephalic. From the mixed and not always reliable data thus obtained no definite conclusion can be drawn, except, we may note, that while the first group contains a large proportion of white races, the second contains a very large proportion of dark races. Among savage and dark races generally it may be said that dolichocephaly prevails; among the prehistoric races of Europe dolichocephaly prevailed to a greater extent than in the Europe of to-day, and the predominance of the brachycephalic is still increasing; the higher age of the dolichocephalic races is suggested (as Virchow remarked) by the existence at both ends of the long continents of dolichocephalic races whose great age we must recognise; the brains of brachycephalic men probably tend to be larger than those of dolichocephalic men;[2] among the

[1] Art. 'Head, Size and Shape of,' in *Dict. of Psychological Medicine.*

[2] Topinard, *Anthrop. Gén.*, 568. Tappeiner found that even among a very brachycephalic people like the Tyrolese the more brachycephalic skulls tend to have the greater cranial capacity, but as regards the extreme brachycephalic group he found that this no longer held good. Matiegka among individuals of the same height found that the mesocephals had the largest brains, the dolichocephals, and the brachycephals being about equal in this respect. Bolk in Holland found the mesocephalic skulls the most capacious, but the brachycephals superior to the dolichocephals; and Ammon states that his results do not contradict Bolk's. Giuffrida-Ruggeri also found that in Italy the mesocephals have the greatest cranial capacity.

criminal, insane, and degenerate generally, while marked brachycephaly is sometimes found, dolichocephaly prevails to a greater extent and in a greater degree; finally, some observers have stated that brachycephaly tends to be associated with large pelves in women.

The differences are often very small, but even in these cases they are sometimes so persistent or harmonious that hesitation is necessary in rejecting them; slight difference with harmonious arrangement was found to be the case among the Alsatians by Pfitzner, and in Spain Sainz and Aranzadi found that in twenty-three provinces the women were more brachycephalic than the men, and in only seven provinces less brachycephalic. In Wales, again, Fleure and James have found that women seem broader-headed than men; for all indices under 80, men were more numerous, and for all indices over 80 women were more numerous.[1] These observations confirm the opinion of the two greatest French and German anthropologists of the last century. It was the opinion of Broca — an opinion founded on extensive experience — that among the dark races women are more brachycephalic than men, although he found them less so among the existing races of western France, and Virchow, in a study of the skulls of the aborigines on the west coast of America, found the women much more brachycephalic than the men; dolichocephaly and hyperdolichocephaly he found chiefly, and the latter almost exclusively, among men.

It is doubtful whether we can say that on the whole the course of evolution is from the dolichocephalic to the brachycephalic. Bischoff believed that we may most properly regard the anthropoid apes as markedly brachycephalic; moreover, they are most so in early life, and the orang, which may perhaps be regarded as the anthropoid with the best developed brain, is the most brachycephalic. In the human species the new-born infant tends to be somewhat dolichocephalic but quickly reaches its maximum brachycephaly.

[1] *Jour. Anth. Inst.*, XLVI (1916), 48.

Children nearly everywhere are more brachycephalic than adults; this occurs in dolichocephalic as well as brachycephalic races, and (as Danielli found among the Nias of Sumatra) when the mother is more dolichocephalic than the father. Thus, for example, Skoff found that for Russians the cephalic index presents its maximum in childhood and diminishes with age, so that skull-growth is more especially in the antero-posterior direction; in adult Russian skulls Popow has found little difference in cephalic index. It is worth noting that in early life, on the whole, at all events among Europeans, girls are decidedly more brachycephalic than boys. Thus Mantegazza found by measuring nearly 100 boys and over 100 girls between the ages of 4 and 14, belonging to the poorer classes at Bologna, that while the average cephalic index in the boys was only 79.10, in the girls it was as high as 83.35;[1] it may be added that the index of the girls is almost the same as that of adult Bolognese men (as ascertained by Calori), the women being rather lower. It is noteworthy that while Clapham found the average cephalic index of his insane men to a small fractional extent greater than that of the women, below the age of twenty the index of the women was markedly higher (82.9 against 78.6), and this difference was chiefly due to defective antero-posterior development in the girls. Gerald West, who measured over 3000 children between the ages of four and twenty-one in the schools of Worcester, Massachusetts, finds that the maximum width of head is reached earlier in girls than in boys; that the index of girls during the period of growth is on the whole higher than that of boys; and that while the final index for girls is nearly the same as that reached at five years of age, the final index for boys is 1½ per cent below that attained at five years of age.[2] In line with these inquiries we may probably place the investigations of

[1] Mantegazza, *Arch. per l'Antrop.*, V. In England, also, Muffang found that at Liverpool girls are more brachycephalic than boys.

[2] G. West, 'The Growth of the Body, Head, and Face,' *Science*, 6 Jan., 1893.

Gönner who found by the examination of 100 infants at birth that the cephalic index of the child at this period tended to be nearer to that of the mother than to that of the father, so that the mothers' heads were somewhat more infantile than the fathers'.[1] As regards English children, Macalister finds that the change from brachycephalism to mesaticephalism takes place shortly after the completion of the first dentition.

It is thus evident that the greater brachycephaly of women is, as Hansen points out, an infantile characteristic due to the general phenomena of growth, the infant's head being at the outset broad, and growth being predominantly in length.[2] It will be observed that the youthful brachycephaly of women is owing less to excessive breadth than to defective length of the skull. This late antero-posterior growth is due not so much to brain development as to the expansion of the air-sinuses in the frontal bone, which in childhood scarcely exist and which become more pronounced in men. We have already seen that the races in which the women are more brachycephalic outnumber those in which the women are more dolichocephalic than the men. The opinion may be hazarded that if any further sexual difference is ultimately found it will be in favour, on the whole, of the somewhat greater brachycephaly of women among the darker and more primitive races, and a possibly greater tendency to dolichocephaly among the fair and civilised European races.[3]

[1] Gönner, *Zt. f. Geburtsh. u. Gynäk* (1895). The special characters of the fœtal skull have been studied by Sergi (*Rivista di Scienze Biologichi*, II, 1900), who finds that the characteristic shape of the fœtal skull is pentagonal, this being due to the prominence of the centres of ossification, and that the presence of this shape in adult life, instead of the more usual ellipsoid or ovoid, indicates the persistence of a fœtal character.

[2] Stratz (*Naturgeschichte*, 212) further associates the brachycephaly of women with the greater softness of the skull in women.

[3] This conclusion was later confirmed by data put together from scattered sources by Karl Pearson (*Chances of Death*, I, 349 *et seq.*). If we divide the series brought forward by Pearson into two groups, one in which the women are more dolichocephalic, and the other in which the women are more brachycephalic, than the men, we find that the first group consists almost exclusively of civilised races, while all the more primitive races are included in the second group, which also includes various civilised peoples.

It is not difficult to understand why this should be so when we remember that the child is brachycephalic, and that while women approximate to the child-type more closely than do men, the anatomical tendency of civilisation is also to a nearer approximation to the child-type than commonly prevails among savages. Bloch, referring to the presence of brachycephaly in ancient graves which yet contain a majority of dolichocephals (a puzzling phenomenon noted by Lissauer and Virchow in Germany, and by Matiegka in Bohemia), argues that there has been an evolution of dolichocephaly into brachycephaly, and that women have headed this evolution.[1] It must be added that in modern times there is a tendency for urban populations to be more dolichocephalic than the surrounding rural population. As urban populations are increasing at the expense of rural populations, we here seem to have an evolutionary tendency in the opposite direction.

THE FACE

It will be convenient here to consider briefly the structure of the face. Speaking of the face generally, it must be said that its evolutional tendency is to become smaller while the skull becomes larger; the apes, as is specially obvious in the gorilla, have enormous faces compared to their small skulls; the human face, comparatively, is small; and woman's face compared to her relatively large head is usually stated to be smaller than man's; so that, as Soemmering pointed out more than a century ago, while man is in this respect higher than the apes, woman is higher than man.

The evolution of the face from childhood to adult life has at present attracted singularly little attention, although it is full of interest. A notable investigation was carried on at Worcester, Massachusetts, by Professor West of Cambridge, Massachusetts, on 3250 individuals between the ages of 5 and 21.[2] There seems to be a certain amount

[1] A. Bloch, *Bull. Soc. d'Anth. Paris* (1911), nos. 1 and 2.

[2] 'The Growth of the Face,' *Science*, 3 July, 1891; 'The Growth of the Body, Head, and Face,' *Science*, 6 Jan., 1893.

of parallelism between face-growth and stature-growth, both in the tendency to periods of retardation of growth, in the temporary relative predominance of girls at puberty, and the more continued growth in men. The evidence points to the existence of three periods of growth, the first ending at about the age of 15. Between the ages of 11 and 13, girls approach boys in the diameter of the head, while in the diameter of the face at the age of 12, girls seem quite to reach boys. 'In proportion to the length of head,' West remarks, 'the width of head and width of face of girls are generally greater than those of boys, and in proportion to the width of head the width of face is also greater in girls than in boys.' It was found that while the face in girls ceases to grow at the age of 17, in boys it is still growing at 18, and probably continues to grow afterwards. This seems to show that women's faces, like their heads, may be relatively broader than those of men, though at the same time, in accordance also with the impression gained by observation, and, indeed, with the result obtained by Kollmann's facial index, they are relatively short, as in children. These results were confirmed by Pfitzner's observations on a large number of adult subjects in the Anatomical Institute at Strassburg; he found that the face in women is relatively broader and shorter, these characteristics leading to a greater conservation of the infantile type. Pfitzner found the sexual differences in the length-breadth index of the face very constant, regular, and marked when compared with the trifling sexual differences in the length-breadth index of the head.[1]

As the lower part of the face with the lower jaw is less developed in women than in men, the upper part with the orbits forms a relatively larger part of the face and tends to appear larger than it actually is, an appearance which is probably still further emphasised by the frequently rounder or more oval shape of the orbit in women, and

[1] W. Pfitzner, *Morphologische Arbeiten*, Bd. VII, Heft 2 (1896); and *Zt. f. Morph.*, Bd. III, Heft 3 (1901).

perhaps a really relatively greater height of the orbit. The actual difference is less than it appears. Paul Bartels found that, except among Malays and Singhalese, it is not absolutely greater in women, but, in agreement with Huschke, Welcker, Weisbach, Ecker, and Rebentisch, he decided that it is relatively larger. Zeiler, on the other hand, as well as Ranke, found the capacity of the orbit, relatively and absolutely, less in the females both of apes and the human species. Relatively, he concludes, it is much greater in apes than in men, and there is an increase with age which is specially marked in the case of apes.

On casual inspection women's eyes seem to be generally larger and more prominent than men's. This effect is for the most part apparent only, and is due to a large extent to the overarching of the bony ridges above the eyes in men. The races in whom this distinctively masculine character is deficient have an infantile or feminine appearance. The eye itself, according to Priestley Smith, is at all ages very slightly larger in the horizontal diameter in men than in women, but the difference is extremely small.

There does not appear to have been much careful comparison of the noses of men and women, though it is believed that the nose is relatively larger in women. The ear has received more attention in this connection, though it fails to lend itself easily to description. Sir Arthur Keith, in an interesting paper on 'The Significance of Certain Features and Types of the Human Ear,' has distinguished two types of human ears, the orang-type and the chimpanzee-type. The orang-type resembles that of the anthropoid ape from which it is named in having a small helix or external circumference, while the chimpanzee-type has a large wing-like helix, and therefore is nearer to that of quadrupeds. It is the ear of orang-type which is in the line of human development, but it possesses a larger anti-helix — that part of the ear which bounds and deepens the inner shell — than the orang-utan shows. From investigations in England, Scotland, Wales, and Ireland, as well as

among Jews, Keith found that the orang-type of ear occurs in 38 to 51 per cent of women but only 16 to 27 per cent of men; or, to take the average, in 45 per cent women and 18 per cent men. The chimpanzee-type, on the other hand, occurs four or five times more frequently in men than in women. This is 'what one may expect,' Keith remarks, 'for in bodily characters, always excepting those of a sexual nature, woman apparently foreshadows the coming characters of the race.' [1] Schwalbe at Strassburg, it may be added, had previously insisted that the human male ear is in general much nearer to the ape than the female ear.

THE FACIAL ANGLE

This angle, which, speaking roughly, indicates the amount of protrusion of the upper jaw, has not — in the general neglect of the face in favour of that portion of the skull in contact with the brain — led to the general recognition of any sexual distinctions. This is largely due to the various ways in which craniologists have determined it. Welcker (followed by a large number of craniologists) measured the facial angle by the degree of projection of the spine of the nose at its base as compared to the root of the nose. This index, in the hands of most observers, shows women to be more prognathous than men. Thus Benedikt, investigating this angle, found prognathism more marked in infants than in adults, and that while prognathism decreased with age (instead of, as among the lower animals, increasing with age) women remained slightly more prognathous than men, usually about half a degree.[2] Topinard considered that the most important of all the facial indices for indicating morphological rank is the alveolar-sub-nasal index, which in a somewhat different way also indicates the degree of protrusion of the upper jaw. The investigation of this index shows that

[1] *Nature*, 7 Nov., 1901.

[2] Benedikt, *Kraniometrie und Kephalometrie* (1888), 31.

prognathism is much greater among lower than among higher races. Among Hottentots, for example, it is nearly 50; among English, French, and Germans, it oscillates around 20, while Mongols and Polynesians come midway. In every large Indo-European series women are said to be more prognathous than men. Among Parisians, for example, from the twelfth to the nineteenth centuries, among Bretons, Auvergnats, Basques, Corsicans, as well as among ancient Egyptians and Javanese, women are considered to be more prognathous than men. But it is a curious fact that this is not so among the darker races in a lower stage of civilisation, nor does it appear to be so among the Chinese; among African Negroes, Nubians, and Bushmen, also, the women are less prognathous than the men.[1] Women would thus possess on the whole, at all events among European races, a tendency to alveolar prognathism. This, although a savage character, is far from being a defect; it frequently imparts, as Virchow remarks, a certain piquancy to a woman's face. Perhaps the naïve forward movement of slight prognathism in a woman suggests a face upturned to kiss; but in any case there is no doubt that while not a characteristic of high evolution, it is distinctly charming.

When, however, we investigate other forms of the facial angle, more especially those which show the projection of the upper part of the jaw in relation to the forehead, it is usually found that women are, if anything, less prognathous than men. These are, however, less characteristic varieties of the facial angle. It is possible to estimate the total prognathism of the face by taking the profile as a whole, with the inclusion of the lower jaw, and to measure the projection of the angle where the teeth meet. This is measured by Camper's maxillary angle (quite distinct from Camper's facial angle), which takes as its apex the junction of the teeth, while the base is at the forehead and at the point of the chin. Topinard attached great impor-

[1] P. Topinard, *Revue d'Anth.* (1872), 628; and 1873, 71 and 251; Manouvrier, *l'Année Psych.* (5th year, 1899), 582.

tance to this angle, almost as much indeed as to the mass of the brain or to the erect attitude, because it enables us to arrange many zoölogical species in their order of morphological evolution, as well as to classify the individuals within a species. The larger the maxillary angle the higher the degree of evolution. It is found that in women, both among the higher and the lower races, the maxillary angle is always markedly smaller than in men. But the greater prognathism of women remains doubtful, and Manouvrier considered that the facial angle is fallacious as a method of determining sexual differences.

While prognathism of the lower part of the upper jaw must be regarded as a reminiscence of a more primitive age, the protrusion of the lower part of the lower jaw is a distinctively human character which is most marked in the highest European races. In women the chin is usually less prominent. In women also, as in children, the angles of the jaw are decidedly large.

On the other hand, women show a higher degree of evolution than men, and at the same time approach the infantile type, by the relatively smaller weight of their jaws, as has been shown by Bertillon, Morselli, Orchanski, and others. The lower human races, as well as the apes, have relatively larger lower jaws, and the same tendency is often said to exist among criminals; but while woman's skull is to man's as 85 to 100, woman's jaw is to man's as only 79 to 100.[1] Rebentisch regarded this as the most important of sexual distinctions. If, however, the cranial capacity rather than the cranial weight is compared to the weight of the jaw, it is claimed that no sexual difference is found. This tends to show that the relationship of the nutritional system to the nervous system is the same in both men and women. It is also noteworthy that Mochi's maxillary dynamometer shows that sex differences in the power of the jaws are comparatively slight, as compared to the inferiority of women in other muscular respects.[2]

[1] E. Morselli, *Arch. per l'Antrop.* (1876).

[2] Mochi, *Arch. per l'Antrop.* (1907), 463.

THE TEETH

It is rather surprising that little attention has been given to the anthropological examination of the teeth among European races, although it is a promising field where examination is comparatively easy. A few anthropologists, Schaaffhausen and Flower, for example, reached interesting results, but dental surgeons, so far as I have been able to elicit by inquiries of some of the heads of the profession, have added little to our knowledge of sexual differences. Gorham, who weighed several thousand teeth, said nothing whatever as to differences according to sex.[1] Among the lower as compared to the higher human races it is generally agreed that the teeth are larger and more regularly arranged, that the wisdom teeth resemble the other molars and are less cramped and not so frequently absent, while the dental arch is squarer and not so rounded as in the more civilised races. There is also no doubt that among primitive races, whether of earlier or our own times, the upper jaw and palate exhibit fewer irregularities and malformations, being usually well formed and developed; it would also appear that among the higher and middle classes irregularities are of more frequent occurrence than among the working classes. A powerful jaw, and perhaps also various mental qualities correlated with such a jaw, are of less primary importance under the conditions of civilised than of savage and barbarous life. The tendency of civilisation is to decrease the number and size of the teeth, and to decrease the size, and often to deform the bony cavity, of the mouth.[2]

As the lower jaw is in women markedly smaller than in men, while the teeth show no corresponding reduction, we should expect disturbances of development to occur with special frequency in women. This seems to be the case. That the jaws of women have a marked tendency to be defective in size and consequently to cramp the teeth,

[1] *Med. Times*, 9 Jan., 1875.

[2] See, for instance, Oakley Coles, *Deformities of the Mouth*, 34.

there is much evidence to show. Sir C. S. Tomes wrote in a private letter: 'Speaking from a general impression, which, as you know, is nearly valueless in such a matter, I should say that contracted dental arches necessitating the extraction of teeth for space are commoner in female than in male children.' An examination of the various tables appended to the fourth edition (1901) of Talbot's interesting and instructive work, 'The Irregularities of the Teeth,' seems to show that on the whole abnormalities of the jaw, more especially a tendency to the V-shaped arch, are especially frequent in women.

It has been found by Spanton, among 200 healthy breast-fed infants of the working class in Manchester, that the first dentition begins earlier in girls than in boys, the average difference between the sexes in this respect being thirty-one days. There appears to be a corresponding difference as regards the permanent teeth.[1] Magitot found by an examination of the wisdom teeth in men and women that they are more precocious in women than in men in France, the maximum number appearing at 22 years, in men at 23 years — although at 25 years there happened to be 10 women to 6 men.[2] An elaborate study of dentition by Psyche Cattell of Harvard, dealing statistically with the data from 11,000 school children between 5 and 14, confirmed the precocity of girls who were found to be dentally six months older than boys of the same chronological age. But 'dental age' was not found of great general significance, and Miss Cattell regards chronological age as probably the best measure of physical maturity.[3]

Galippe found the density of the teeth to be slightly greater in men than in women; but if we examine the data which have been accumulated during recent years as to the incidence of caries, there are no marked sexual dif-

[1] A. T. Spanton, *Brit. Med. Jour.*, 8 June, 1907.
[2] *Bull. Soc. d'Anth. de Paris*, 20 Feb., 1879.
[3] Harvard Monographs in Education, no. 9, 1928.

ferences. In some countries one sex seems more liable to caries than the other, but on the whole the incidence is equal.[1]

Flower constructed a dental index by multiplying the dental length by 100, and dividing by the basio-nasal length (or length from the naso-frontal suture to the edge of the *foramen magnum*). He found that the white races are microdont (possessing, that is, small teeth and a small dental index); the yellow races are mesodont; the black races megadont, with large teeth and a large dental index, while among the anthropoid apes the dental indices are still larger. Among the apes the dental index among females is always greater than among males. A similar sexual difference is seen in the human species, the teeth in women more nearly retaining their size while the cranium with the body generally is less. The difference is, however, slight among European races.

Schaaffhausen sought to show that the two upper middle front or incisor teeth are in women and girls not only relatively but absolutely larger than in men and boys of the same age. Comparing 50 girls to 50 boys of the ages of 12 to 15, he found that the average breadth of the teeth in question was as 1.33 in girls to 1 in boys. Among 12 men belonging to Zandvoort, in Holland, he found an average breadth of 8.3, while 12 women gave a breadth of 8.8. In some women undoubtedly the teeth in question are conspicuously large. Schaaffhausen's conclusions were criticised by Parreidt, who measured the incisor teeth of 100 men and 100 women at Leipzig, and found that at most decades of life the central incisors of men were absolutely larger than those of women, but he ultimately agreed that they are relatively smaller. Paul Bartels also

[1] A summary of various observations will be found in Lipschitz, 'Caries-frequenz bei Schulkindern,' *Comptes Rendus XII Int. Cong. Med.* (Moscow, 1897), V, 6. For English conditions, see *Brit. Med. Jour.*, 21 July, 1900, and 21 and 23 Feb., 1907. Analyses given in Tomes's *Manual of Dental Anatomy* (8th ed., 1923, p. 39) indicate more calcium phosphate in the enamel of men's teeth than of women's.

measured the teeth on over 60 skulls, and reached the same results as Parreidt.[1] Max Bartels, however, supported the conclusion that this sexual distinction is world-wide. Stratz associates the large incisors with the relatively broader face in women, and regards them as a mark of feminine beauty. Reitzenstein agrees, but cannot find here a real sexual characteristic. It is probable, however, that in the lowest human races the sexual difference is less, both men and women possessing large middle incisors; this has been noted by Klaatsch among the Australians.[2]

In considering the lower part of the face in the two sexes we thus see that there are notable differences, perhaps constituting secondary sexual distinctions of the first order. In men the jaws develop to a much greater extent, are furnished with more powerful muscles, and become the seat of prominent hairy appendages. In women, even if the incisor teeth remain large, this region generally is softer, more rounded, smaller, altogether markedly less developed, this difference extending from the external ears to the larynx. The lower part of the face is in women both more infantile and more primitive, while at the same time revealing less animality and higher racial, though not individual evolution. These distinctions, while of importance as secondary sexual character, may also possess a significance of another order, and Woods Hutchinson has ingeniously suggested that they may help to account for the varying sexual incidence of cancer. It is well known that the two organs most affected by cancer are the breast and the womb. When we leave these two feminine sexual glands out of account it is found that cancer is somewhat more prevalent in men, and the region common to both sexes in which it most markedly prevails in men is precisely the district around the mouth. Cancer of the ear, larynx, parotid, mouth, pharynx, throat, œsophagus, neck,

[1] Paul Bartels, *Ueber Geschlechtsunterschiede am Schädel*, 36–41; he gives a good account of the whole controversy. Also Ploss, *Das Weib*, I, 60.

[2] *Zt. f. Eth.* (1901), Heft 3, p. 137.

and jaws is in nearly every case twice as frequent in men as in women, and on the whole nearly three times as frequent as in women. Now all these organs are closely connected with the mouth, and it is usual to put forward the idea that the greater frequency of cancer here in men is due to smoking. This explanation, common as it is, seems rather far-fetched. As Woods Hutchinson points out,[1] cancer tends to appear in those organs in which function is decaying, while the vitality of the rest of the body is well maintained. This is conspicuously the case as regards the breast and womb. But it is also the case, Woods Hutchinson observes, with regard to the highly developed masculine mouth-region. After the age of fifty senile regressive changes here begin to take place towards the infantile condition, and relatively these changes are much greater in men, because in women this region already approximates to the infantile type. The liability of this region to cancer in men would thus be a phenomenon of degeneration in a highly developed region of sexual significance, strictly comparable to the liability of the womb and breast to cancer.

CRANIAL CAPACITY

A considerable amount of attention has been given to the question of sexual differences in cranial capacity, but the results have been small. In nearly every large series of skulls, ancient or modern, savage or civilised, the cranial capacity is found to be considerably greater in men than in women. But when we consider that the body-weight is also considerably greater in men this result is not surprising, and while some anthropologists have asserted that the cranial capacity of men is relatively somewhat greater than that of women, others have been at least equally justified in deciding that the cranial capacity of women is relatively greater than that of men. At the best, cranial capacity is not an exact indication of brain size; and to

[1] *Studies in Human and Comparative Pathology* (1901), 268.

measure brain size by the external size of the skull furnishes still rougher and more fallacious approximations, since the male skull is more massive than the female.[1]

A point of some interest, which was noted long ago by Retzius,[2] and has since often been raised, is the relative sexual difference in the higher and in the lower races; it is a question whether in the higher races there are not greater sexual differences than in the lower races. I have prepared the following list bearing on this point, using many of the figures obtained by Weisbach, and also working out the proportions given by Topinard, Flower's as harmonised by Topinard, and adding others from different sources.[3] The list shows in order of diminution the woman's skull compared to man's:

Negro (Davis) — Bushman (Flower) — Hottentot and Bushman (Broca) — Hindu (Davis) — Negro (Tiedemann) — Eskimo (Broca) — Australian (Broca) — Malay (Tiedemann) — Dutch (Tiedemann) — Prussian (Kupffer) — Irish (Davis) — Andamanese (Flower) — New Caledonian (Broca) — Dutch (Broca) — Tasmanian (Broca) — Kanaka (Davis) — Veddah (Davis, Flower, Virchow, Thomson) — Marquisas (Davis) — German (Welcker) — Auvergnat (Broca) — Aino (Koganci) — Tyrolese (Tappeiner) — Bavarian, town-dwelling (Ranke) — Aino (Kopernicki) — Australian (Flower) — Bavarian, country-

[1] It is worth noting that woman's skull constitutes a larger part of the total bony skeleton than man's. Thus Manouvrier's cranio-femoral index gives the relation of the weight of the thigh-bones to that of the skull, the latter equalling 100. Most women (83 per cent) have heavier skulls than thigh-bones; in most men (81 per cent) the thigh-bones are heavier. From this point of view the relative size of the skull diminishes in the following order: child, woman, short man, tall man, ape.

[2] Müller's *Arch. f. Anat.* (1845), 80. Huschke in 1854, Vogt and Welcker a few years later, pointed out the tendency to greater sexual differentiation of the skull among civilised peoples. This was in 1904 disputed by Giuffrida-Ruggeri who, however, somewhat inconsistently, accepted the statement of Topinard that among short peoples (who prevail among lower races) we should expect less sexual difference than among tall peoples (who prevail among higher races).

[3] Weisbach, *Arch. f. Anth.*, Bd. III (1868); Topinard, *L'Homme*, etc. (1891), 218.

dwelling (Ranke) — Scotch (Turner) — Russian (Popow) — German (Davis) — Alsatian (Schwalbe) — German (Weisbach) — Ancient British (Davis) — Javanese (Tiedemann) — Australian (Turner) — Chinese (Davis) — German (Tiedemann) — Anglo-Saxon (Davis) — Parisian of the 12th century (Broca) — English (Davis) — Parisian of the 19th century (Broca) — Javanese (Broca) — Eskimo (Flower) — German (Huschke).

This list seems to bring out on the whole a gradual sexual divergence in cranial capacity under the influence of evolution and civilisation. There are naturally many discrepancies, due to some of the series included being too small, or abnormal, or to difference in methods of measurement. Thus if from the series of Veddah skulls two were to be omitted — an abnormally large masculine and an abnormally small feminine skull — it would be found that the Veddahs, a very primitive race, would come at the top of the list, where they perhaps belong. It must of course be remembered that we cannot rashly assume that this divergence, if real, is entirely due to civilisation. It may be largely a matter of race, as Waldeyer believed. In an article mainly evoked by the first edition of the present book Waldeyer wrote: 'It may sound daring, but I believe it is not civilisation that gradually produces larger skulls and brains, but that the stocks that possess large skulls and brains attain the higher culture.'

There are, however, two great factors working for increased cranial capacity — large size of body and mental activity — which both operate in civilisation. Among the small Maravers of southern India the cranial capacity of the women is, even absolutely, rather greater than that of the men; among the large-bodied Germans the cranial capacity of the women is relatively very small. Town-dwellers have a larger cranial capacity than country-dwellers, but the muscular labour undergone by country-dwellers keeps their cranial capacity at a fairly high level. The town-dweller without either manual or mental work

stands very low, and in civilisation both the heaviest manual and the heaviest mental work falls to men. It is perhaps worth noting that Jacobs and Spielmann found that while West End Jewesses are distinctly inferior to West End Jews in cranial measurements, there is comparatively little difference between East End Jews and Jewesses. It must be realised, however, that there are very distinct limits to the equalisation of cranial characters by the equalisation of social conditions. Among orangs and gorillas the sexual cranial differences are enormous. The Australians are almost the lowest of human races, and live under the simplest conditions, but, as Turner remarks, examining the Challenger skulls, 'The sexual characters were strongly marked in the Australian crania. The much smaller size and capacity of the female skull, its comparative lightness, the feebleness of its ridges and processes, more especially the glabella; its low basi-bregmatic height and the high orbital index, all constituted important features of difference between the female and the male skulls.' The relatively greater difference in cranial capacity among civilised than among savage races generally, however, remains a fact of some interest and significance.

It has often been asserted, and more especially in the earlier days of craniology, that the frontal regions of the skull, regarded as the 'nobler' regions, are more developed in men than in women. There is, however, no reason for supposing that the frontal region is higher or more characteristically human than any other cranial region; and there is just as little reason for supposing that the frontal region is more highly developed in men. Cleland, who compared the three regions of the skull — frontal, parietal, and occipital — in men and women, could find no noteworthy difference. Manouvrier, who made the most extensive and reliable investigations on this point, found, by the examination of Broca's registers, that the frontal curve is relatively larger in women than in men in 14 series of skulls out of 17; that the parietal curve was

relatively larger in women in 6 out of 17 series. He therefore came to the conclusion that women exhibit a frontal type of skull, men a parietal type.[1] That the occipital region is also relatively larger in women has been found as well by Manouvrier as by Weisbach, who in his careful investigations of the German skull came to the conclusion that there is greater height and length in the occipital skull in women with equal breadth. Topinard's figures of the relative breadth of the different regions of the head in Parisian men and women show little or no superiority of breadth of the frontal region in women, but a very markedly greater breadth of the posterior region of the head, indicating large size of occipital lobes and cerebellum. He found as a rule this breadth greatest in the superior races; 'the cephalic index of Russians and Javanese is almost the same, but the former, a higher race, have greater occipito-cerebellar breadth; the Basques have, almost to a decimal, the cephalic index of the Tasmanians, but they have greater occipital breadth; Parisian men have only two units of cephalic index more than Parisian women, but the latter have eight units more of occipital breadth.'[2]

On the whole, we have found no valid ground for concluding from an examination of the skull that one sex is

[1] Manouvrier, *Bull. de l'Assoc. fran. pour l'avancement des Sci.* (1882), 623–39. Also Art. 'Sexe,' *Dict. des sci. Anthrop.* Daffner (*Das Wachsthum des Menschen*) found the frontal breadth practically the same in both sexes, although the circumference was much greater in males. It may be noted here that a high forehead is by no means, as commonly supposed, the necessary accompaniment of high mental capacity. In women, Benedikt (*Kran. u. Keph.*, 125) was accustomed to regard it as an indication of convulsive degeneration, and referred to the instinctive concealment by women of a high forehead by arrangement of hair.

[2] Topinard, *L'Anth. Gén.*, 694. Wilks (*Lectures on Dis. Nervous System*) remarks, 'We have only to look at the head of a person with his faculties well developed to see a considerable projection behind, whilst in a person of low development the neck and head are in one line.' (It would perhaps be better to say 'imperfect' rather than 'low' development, since this small occipital development is sometimes found in men of marked intellectual ability.) Clapham found, as a result of the measurement of 4000 heads, as regards the proportion of the anterior segment to the whole circumference, that the anterior segment increases rather than diminishes in passing from the sane to the insane, and from the insane to idiots (*Jour. Ment. Sci.*, April, 1898, p. 293).

morphologically superior to the other sex. The only well-marked and generally acceptable sexual cranial differences, so far as our present knowledge extends, are those pointed out at the outset: in men the air-sinuses and the muscular projections are more marked, and in women the bosses are more prominent. In all three of these respects men approach the savage, simian, and senile type (for these, as we have seen, and as Virchow pointed out, approximate to each other), while in all these respects also women approach the infantile type.[1] It is open to a man in a Pharisaic mood to thank God that his cranial type is far removed from the infantile. It is equally open to a woman in such a mood to be thankful that her cranial type does not approach the senile.

THE BRAIN

The history of opinion regarding cerebral sexual difference forms a painful page in scientific annals. It is full of prejudices, assumptions, fallacies, over-hasty generalisations. The unscientific have had a predilection for this subject; and men of science seem to have lost the scientific spirit when they approached the study of its seat. Many a reputation has been lost in these soft and sinuous convolutions. It is only of recent years that a comparatively calm and disinterested study of the brain has become in any degree common; and even to-day the fairly well ascertained facts concerning sexual differences in the brain may be easily summed up.

There is no doubt whatever that in European races (for of other races our knowledge is scanty) the absolute

[1] The special morphological characters of the feminine skull as intermediate between the infantile and masculine type were shown by Lissauer (*Arch. f. Anth.*, 1885), and this point was often emphasised by Virchow. Paul Bartels (*Ueber Geschlechtsunterschiede am Schädel*, 1897, p. 97) considered the absence of animal characters in the female skull as compared to the male one of the chief results of his investigation. The arguments of an eccentric zoölogist, Albrecht, in favour of the 'greater bestiality' of women in anatomical respects (*Correspondenzblatt Deutsch. Gesell. Anth.*, 1884), need not be seriously discussed.

weight of the brain in man is considerably greater than in woman. The following are a few of the averages reached by some of the chief investigators in different countries, working on a large number of brains, most of the series comprising many hundreds:

		Grammes	Difference
Wagner	Men	1410	148
	Women	1262	
Huschke	Men	1424	152
	Women	1272	
Broca	Men	1365	154
	Women	1211	
Topinard	Men	1360	110
	Women	1250	
Bischoff	Men	1362	143
	Women	1219	
Boyd [a]	Men	1354	133
	Women	1221	
Manouvrier	Men	1353	128
	Women	1225	
Handmann	Men	1355	132
	Women	1223	

[a] These figures were obtained from Boyd's well-known investigations at the Marylebone Infirmary, London. Sir James Crichton-Browne obtained very similar results with the brains of the insane. From an examination of nearly sixteen hundred brains he found that the average in the male was 1351 grammes, in the female 1223 grammes; the male average is a little lower than in the sane, on account of the serious nature of brain disease in men, and consequently in insanity the sexes approach each other in brain-weight more than in sanity.

It is clear that in Europe men possess absolutely larger brains than women. There is no doubt on this point. The difficulty has arisen at the next stage. Have men relatively larger brains than women? We have first to decide relatively to what we are going to compare the brain. Height has usually suggested itself as the most convenient term of comparison. It would be better, as Topinard suggests, to take the height of the body only, ignoring the legs, but, so far as I am aware, this is never done. It is not difficult to ascertain with fair accuracy the average height of a population, and it is evident that when we have brought the brain into relation with the stature we have made some approximation to a fair estimate. Relatively to stature, it is nearly always found that men still possess

somewhat heavier brains than women. Thus, according to Boyd's average as well as Bischoff's, man's brain-weight is to woman's as 100 to 90; the average stature of men and women in England is as 100 to 93; so that, taking stature into account, men have a slight but distinct excess of brain (amounting, roughly speaking, to something over an ounce) over women. Precisely the same difference in ratio has been found in France.[1] On the strength of this ounce a distinguished brain anatomist has declared that 'the difference, therefore, in the size and weight of the brain is obviously a fundamental sexual distinction,' and the same assertion has often been made by others.

On consideration, however, it becomes clear that while it is very convenient, and even approximately correct, to estimate sexual differences in brain-mass relatively to sexual differences in body-height, it is not quite fair to women. Men are not only taller than women, they are larger. If human beings, while retaining their present height, were moulded into circular columns the same size all the way up, the male columns would be usually of greater circumference than the female columns. As we found in Chapter VI, there is only one measurement — the girth of the thighs — which is almost constantly larger in women. It is clear that we should be doing an injustice by comparing the amount of brain of the female column to that of the male column, for the male column must necessarily possess an absolutely larger amount of brain-tissue per foot, merely in order to equal the percentage amount of the female column. That additional ounce is fully needed merely to place men on a fair equality with women.

Blakeman attempted to overcome the difficulty by comparing the brain-weights of men and women at the same stature.[2] As Lapicque, however, justly points out, such a

[1] A discussion on this point will be found in Topinard's *Ant. Gén.*, 557. As regards Germany, Handmann (*Arch. f. Anat. u. Phys.*, 1906) found a similar very slight advantage in favour of men.

[2] *Biometrika*, IV (1905).

proceeding cannot fail to shock a naturalist; sex apart, women of the average height of m. 1.60 are not identical with men of the same height; it is illegitimate to compare groups which are above the normal with groups which are below the normal, and would be like comparing two animals of different species because they happened to be of the same size.[1]

The evident inaccuracy of the stature criterion has therefore led a number of eminent craniologists — Clendinning, Tiedemann, Reid, Wagner, Weisbach, etc. — to adopt the method of estimating sexual differences in brain-weight in accordance with their ratio to body-weight. This is obviously a more logical method. The almost constant result is that, proportionately to body-weight, women are found to possess brains somewhat larger than men's, or else brains of about the same size. This was ascertained many years ago by Parchappe, Tiedemann, Thurnam, and others, in England, France, and Germany. Bischoff, in his important and accurate work on the brain, showed similarly that while woman's brain-weight is to man's as only 90 to 100, woman's body-weight is to man's as only 83 to 100; Vierordt also illustrated the same fact, that relatively to body-weight women have larger brains.[2] It may be taken as proved that in relation to body-weight — a more logical relation than that to body-height — women's brains are at least as large as men's and are usually larger.

We have, however, not even yet reached a fair statement of the relative amount of brain-mass in men and women. To estimate brain-weight by its ratio to body-weight is

[1] *Bull. Soc. d'Anth.* (1907), 344. The question was discussed before the Paris Society of Anthropology as long ago as 1882, Le Bon asserting that it was sufficient to choose boys and girls of the same weight, and Manouvrier declaring that we must take the totality of a sex.

[2] T. L. W. von Bischoff, *Das Hirngewicht des Menschen* (Bonn, 1880); H. Vierordt, *Archiv für Anat. u. Phys.* (1890). Topinard (*Anth. Gén.*, 530 *et seq.*) also discussed this question. Messedaglia, the distinguished statistician, again, worked out the problem with the result that the brain-mass of women is relatively greater than that of men. (*Atti della Società Romana di Antropologia*, 1906, fasc. III.)

satisfactory enough if we are dealing cautiously with large averages. But it has to be remembered that we are comparing a comparatively stable element with one which is extremely unstable. The well-to-do, well-nourished, and comparatively lazy classes weigh much more than the under-fed and overworked classes. The relations between body and brain may be quite different in the individuals who die in a workhouse from what they are in the ordinary population. There are not only differences between individual and individual; there are very marked fluctuations in the same individual. A well-nourished individual, dying after a slow and wasting disease has run its course, will appear to possess a relatively much larger brain than if he had died at the outset of the disease. Brain, although not the most stable tissue, is relatively stable, more stable even than bone; fat, which makes up a very large part of the general body-weight, is the most unstable tissue in the body; it is used up on the first call from the over-strained or under-fed organism; while, according to Voit's analyses, 97 per cent of the fat has disappeared at the completion of starvation, the nervous system has only lost 3.2 per cent of its weight. When we compare brain-weight with stature we are falling into a fallacy, but we are comparing elements that are at all events fairly constant, and therefore our error is fairly constant; when we compare brain-weight with body-weight we are on sounder ground, but one of our two elements fluctuates to a much greater extent than the other, and produces an error which is less constant and requires greater care to circumvent.

There is another serious error in estimating sexual differences in brain-mass by the ratio to the bulk of the body. Women, as we have already seen (page 151), are commonly fatter than men. There is a tendency in adult women to deposit fat about the breasts and arms, and especially in and around the abdomen, in the gluteal regions, and in the thighs, a tendency which usually only exists to a moderate extent in men. As we have seen, Bischoff found

that the proportion of fat in the woman to that in the man was as 28.2 to 18.2, and that while the proportion of muscle to fat in an adult man is as 100 to 43, in an adult woman it is as 100 to 78. Though his results were only founded on two typical well-nourished subjects, there is no doubt as to the general tendency of women to deposit fat. It is part of what some have called the anabolic tendency of the female sex — the tendency to acquire rather than to expend — and it is further illustrated by the fact that while men attain their maximum weight at about the age of 40, women, whose growth terminates at a distinctly earlier period than that of men, do not attain their maximum weight until the age of about 50. Now fat is a comparatively non-vital tissue; it needs, compared to muscle, but very little innervation. Therefore it is not fair to women, in studying brain difference in relation to body-weight, to make no allowance for their excess of comparatively non-vital tissue.[1] Manouvrier estimated that the active organic mass of woman's body is to that of man's as at most 70 to 100. This is only an approximate estimate, but in any case the relative excess of brain-tissue in woman is very large, for the sexual ratio in brain-weight may be put with fair constancy, as we have seen, as 90 to 100.

The two usual and most convenient methods of estimating the sexual proportions of brain-mass — the ratio to body-height and the ratio to body-weight — are thus both erroneous, and in both cases the error leads to the assignment to women of an unfairly small mass of brain. It might be thought that there is some fallacy on the other side which would tend to restore the balance. Such a source of fallacy might be thought to lie in the massive bony skeleton of men, but this does not seem to be the case to any appreciable extent. If, for example, we take the skull, the average relation of the weight of man's to woman's is (if we accept Morselli's figures) as 100 to 86; the sexual

[1] Manouvrier especially drew attention to this fact. (*Mém. Soc. d'Anth. de Paris* (1885); also Art. 'Cerveau,' in *Dict. de Phys.*, II.)

ratio of weight of the large and well-to-do members of the Bath meeting of the British Association was 100 to 79; of the small-sized Belgian race (according to Quetelet) it is 100 to 87: so that while these two ratios of bulk differ widely (as we should expect), they oscillate around the sexual ratio of bone-mass. There is indeed one correction which must yet be made, and it is a correction which does something towards restoring relative predominance of brain tissue to men. Independently of sex, and (at all events among mammalia) independently even of species, increase of body-size has a fairly constant and regular tendency to be accompanied by an increase of brain which is relatively less in amount. Tall men have smaller brains, relatively, than short men; tall women have, relatively, smaller brains than short women; and the shortest women have brains that are relatively much larger than those of the tallest men.[1] This law involves a correction which is not large, being scarcely 2 per cent, and perhaps even less, for Bischoff and Tigges have shown that brain increases with height to a greater extent in women than in men. This consideration, however, serves to complicate the problem of the brain-ratio, and to reduce the estimate of the relative predominance of brain-tissue in women. There is ample scope here for the methods of the mathematical anthropometrist. It is along these lines that, since Manouvrier, this question has been most profitably carried on, especially by Eugène Dubois, famous as the discoverer of the *Pithecanthropos*, and by Lapicque in France.[2] The outcome of their work may be said to be that sexual differences in brain-weight are either so slight as to be negligible or they have no existence at all.[3] The old dispute, once so fiercely waged,

[1] Bischoff, Broca, Topinard, etc., have shown that this holds good for either the stature-ratio, the bulk-ratio, or both. See, for example, Bischoff, *Das Hirngewicht*, 32; Topinard, *Anth. Gén.*, 533; J. Marshall, 'On the Relation between the Brain and the Stature and Mass of the Body,' *Jour. Anat. and Phys.*, July, 1892.

[2] E. Dubois, *Arch. f. Anth.* (1898); Lapicque, *Bull. Soc. Anth. Paris* (1907).

[3] The chief step in the anthropological vindication of women, so far as the brain is concerned, was undoubtedly taken by Manouvrier, though he was

may therefore now be said to have passed away. Along this line, moreover, as along other lines, we are being brought to the more fundamental phenomenon of the endocrine balance.

It may be added that a relatively large mass of nervous tissue by no means necessarily implies any natural advantage. The fact that the absolutely large brain is to a great extent the appanage of a large muscular system apparently contributes to its steadiness and tone. A relatively large brain not rooted in a good muscular foundation is not always a good gift of the gods; it is often difficult to turn on effectively to intellectual tasks; it acts uncontrollably and with too much facility; it may be liable to explosive outbursts; it is a fact of some significance that the epileptic possess relatively large brains.[1] A very considerable proportion of the good work of the world has been done by brains which were large, though, relatively to the bulk of the body, not inordinately large. On the whole, however, while we have to recognise that it is the quality of the brain and the relation of its regions to each other that constitute the chief factor, there is evidently an advantage in the possession of a head slightly above the average in size. Thus Bayerthal has shown that by taking eight groups of boys of the age of seven, and eight groups of girls of the same age and dividing the members of each group into four classes in accordance with their standing as pupils, it is the best gifted children, both among the boys and the girls, who have the largest circumference of head,

purely a scientific investigator and in no sense a propagandist. In 1878 when he began work in this field, there were no 'feminists' at all, under that name, and the absolute and relative anatomical inferiority of the female brain was almost taken for granted. Manouvrier first made clear that, so far from this being the case, there was, if anything, a certain superiority on the side of women. In setting forth his general conclusions (*Rev. de l'École d'Anth.*, 1909, pp. 41–61) he wrote: 'The honour of being the champion of women in a just cause was not small in my eyes.' In many respects Manouvrier was in conflict with the old-fashioned French anthropologists of his day. I well recall him at the Paris School of Anthropology in 1890, a quiet, dark little man, always pleased to exhibit the resources of the school and to discuss any subject of anthropological interest that might thus arise.

[1] See, for instance, Clapham, Art. 'Brain, Weight of,' *Dict. Psych. Med.*

although the difference is slight, while in only four groups have the least gifted any superiority over the average. In eleven of the groups the best gifted have larger heads not only than the least gifted but than those of average gifts.[1] It is certain also that various men of genius and ability, both in science and in art, have possessed enormously large brains.

But it is not doubtful that a brain both absolutely and relatively very large is a possession of uncertain value. There is much to be said in favour of a smaller, well-ordered, and active brain. It is possible that great thinkers generally have large brains, but among distinguished men of action a small brain seems to be quite as often found as a large one.[2]

Some light is thrown on the significance of the relative preponderance of nervous tissue in women, by considering the course of the brain's evolution in the two sexes. At birth the boy's brain is larger than the girl's. Boyd, from an examination of about forty cases of each sex, found the average weight 331 grs. in boys, 283 grs. in girls, a difference of 48 grs., and this is accepted by Topinard (and also by Rüdinger) as about the average difference; Mies, however, who recorded the result of the weighing of a large number of new-born infants, found that for 79 boys the weight is 339 grs., for 69 girls 330 grs., a difference of only 9 grs.[3] Boyd's measurements give boys a preponderance of brain in relation to body-weight; Mies's figures, founded on larger experience, give a slight preponderance to brain-tissue in girls. I think that the fact that most observers have found the brains of new-born boys decidedly larger than those of girls may be very simply explained. Children with unusually large heads — that is to say, the children

[1] J. Bayerthal, *Psychiatrisch-Neurologische Wochenschrift*, 1913–14, no. 17.

[2] A valuable summary of previous studies of the brains of eminent men, together with six new cases, was supplied by E. A. Spitzka, 'A Study of the Brains of Six Eminent Scientists and Scholars,' *Trans. of the Am. Philosophical Society*, XXI (1907).

[3] *Wien. Klin. Wochenschrift*, 10 Jan., 1889.

to whom birth is most likely to prove fatal — are more usually boys, and therefore help to raise unduly the masculine average of brain for the new-born; girls are comparatively free from this danger.

The brain grows enormously during the few months after birth, and very rapidly during the first few years of life. While at the age of three months the brain is about the fifth part of the weight of the body, in the adult it forms merely about a thirty-third part. By the age of six months (according to Boyd's fairly large figures) the absolute weight of the brain has doubled in girls, and nearly doubled in boys; by the age of seven years the weight of the brain has quadrupled in girls, and before the age of fourteen it has quadrupled in boys. The precocity of the female brain in childhood is therefore extremely marked. Even Boyd's figures, which give girls a relatively small amount of brain at birth, show that between the ages of four and seven girls possess larger brains than boys in relation to height. While girls between the ages of four and seven have already gained 92 per cent of their final brain-weight, boys at the same age have only reached 83 per cent. The girl's brain grows but little after the age of seven, and has practically ceased to grow by about the age of twenty; the man's brain does not reach its maximum size until after thirty years of age. Owing to the rapid growth of the brain in the first years of life, it is in childhood, and more especially during the ages of two to four, that both sexes possess the largest amount of brain in relation to height. The premature and fallacious maximum in the weight of the brain before the age of twenty, which is found chiefly or exclusively in the female brain by the large series of Boyd, Bischoff, and Broca in three countries, seems to show, as Topinard points out,[1] that the precocity and extent of brain-growth in women at this early age exposes them to greater chance of death than men, just as boys are more exposed at birth; for it must always be

[1] *Anth. Gén.*, 557.

remembered that brain-statistics in early life are exclusively founded on those members of the community who have been failures in the race of life; we cannot necessarily argue from them to the successful members of the community who reach adult life. Soon after the age of twenty the average weight of the brain begins to fall; in men there is no notable fall until after fifty-five; in both sexes there is a somewhat rapid decline after this age, and there is some reason to think that in old age men undergo relatively greater brain-loss than women.

It is time to turn to the question of sexual differences in the relation of the various parts of the brain. In doing this we have to consider the relation of the two hemispheres of the cerebrum, or brain-mantle, to the cerebellum or smaller brain, and to the upper parts of the spinal cord called the pons and medulla oblongata; in the cerebrum we have to distinguish between the frontal lobe in front, the occipital lobe at the back, and the intermediate temporo-parietal region; and we may take these last three sub-divisions of the mantle first.

It has been said by Meynert that sexual distinctions in the brain are much better marked in the relation of its parts to one another than in the organ taken as a whole. But if this is so it is not well illustrated by the curious manner in which the opinions of brain anatomists concerning sexual differences in the proportion of the cerebral lobes have of late years been turned upside down. Some years ago it was asserted with great emphasis, more especially in Germany, that even from an early period of fœtal life there are marked sexual differences in the lobes of the cerebrum, tending to show the great intellectual superiority of man over woman. Burdach considered that men are distinguished from women by the development of their frontal lobes; Huschke, in 1854, came to the conclusion that woman is a *homo parietalis*, while man is a *homo frontalis*; Rüdinger in 1877 found the frontal lobes of man in every way more extensive than those of woman, and

sexual differences, according to him, are distinct during fœtal life; his pupil, Passet, confirmed these results, though in a more modified form. It is quite possible to explain these conclusions. Individual variations are very considerable; most of these results were founded on very small series of brains; the brain, moreover, is a very difficult organ to examine; and, finally, as it had always been taken for granted that the frontal regions are the seat of all lofty intellectual processes, only a result which gave frontal preëminence to men could be regarded as probable.

In the present century brain anatomists have become more cautious in drawing general conclusions as to sexual cerebral distinctions. Thus Waldeyer, adapting the sound plan of comparing the brains of twins and triplets of different sex, finds that there are no uniform sex differences; the fissures and convolutions of the males are sometimes better developed than those of the females; but this is by no means invariable, and even when it occurs it is possibly due to an earlier development consequent on the greater size of the males.[1]

It is no longer possible to accept the opinion that the frontal lobes are defective in women. Broca examined some 360 brains with great care and uniformity of method; his results show that the whole cerebral hemisphere being taken as 1000, while the proportion of frontal lobe in man is as 427, in woman it is as 431; it is only a difference in favour of women of 4 in 1000, but it is enough to show at least a practical sexual equality; on analysing the figures according to age, it is found that while in early adult age men have some frontal advantage over women, this position is decidedly reversed in old age.[2] Among the insane, Crichton-Browne has shown that the proportion of the frontal lobe to the rest of the brain is not less in women,

[1] Waldeyer, *Zt. f. Eth.* (1908), 262.

[2] Topinard, *Anth. Gén.*, 580, and more specially Manouvrier, Art. 'Cerveau,' *Dict. de Physiologie*. F. P. Mall with special reference to weight of the frontal lobes could find no real sexual difference. (*Am. Jour. Anat.*, IX, 1909.)

but is even slightly more; Clapham's figures, dealing with some 450 subjects, show practical equality in the sexes; Meynert and Tigges, dealing with a considerable number of brains belonging to the insane, both found the frontal lobe larger in women. Reliable and accurate measurements were made with special reference to this point by Eberstaller. He measured with great care no less than 270 hemispheres belonging to adults (176 male and 94 female), and he found that the upper end of the fissure of Rolando occupies relatively the same place in the two sexes, what difference there is, only 0.5, being in favour of the frontal lobe in women. The results obtained by Cunningham, a cautious and trustworthy observer, were in exact harmony with those of Eberstaller; so far as he found any sexual difference at all it was in favour of the frontal lobe of women. He also ascertained that the lower end of the fissure of Rolando holds relatively the same place on the cerebral surface in the two sexes. It had been asserted by Passet and others that the fissure of Rolando is longer, absolutely and relatively, in men; Cunningham found, by carefully examining a large number of brains, that (except at birth) there was some advantage, so far as there was any advantage at all, on the part of the female fissure.[1]

While it has thus become clear that women have, so far as there is any sexual difference at all, some frontal superiority over men, it has at the same time been for the first time clearly recognised that there is no real ground for assigning any specially exalted functions to the frontal lobes. This opinion had been widely accepted without definite reasons, and even Hitzig, the pioneer of modern progress in the precise knowledge of cerebral localisation, had given it the weight of his authority by assigning to the frontal lobes the seat of logical thought. It is not difficult to account for this ancient notion; there is a deeply implanted feeling in the human mind which associates with

[1] D. Cunningham, *Cunningham Memoirs* of the Royal Irish Academy, no. 7, 1892.

'above,' 'front,' 'top,' more dignified ideas than with 'below,' 'back,' 'bottom.' The frontal region exactly fits in with this implicit mental assumption; it is precisely that part of the body which is most above, to the front, and to the top; it is not, therefore, surprising that the centres for the highest intellectual processes should have been placed in a position where we can scarcely believe that a quadrupedal craniologist would have placed them; nor is it surprising that it is only within very recent years that we have brought ourselves to believe that the occipital lobes are intimately concerned in so high a process as that of vision. The extreme anterior part of the brain, usually called the prefrontal lobe, gives little definite reaction to electrical stimulus (though the fact that the frontal region is inexcitable to electrical stimulus is no argument against its importance in intellectual processes);[1] and there is no decisive experimental ground for associating the frontal region with intellectual processes in any special and peculiar manner. Moreover, the frontal region is, relatively, already considerably developed in the anthropoid apes. Nor is the frontal lobe relatively more developed in the adult than in the fœtus. And it may be added that in woman, in whom it is if anything more developed than in man, the relations of the frontal region (as Cunningham's results show) more nearly approach the anthropoid form than man's; although in one important respect, as Cunningham points out, men in the relations of this region approach the apes more nearly than women: the area of the frontal lobe covered by the parietal bone is relatively less in men than in women. It must be added that while at present it cannot be definitely asserted that the frontal parts of the brain are specially connected with the higher mental processes, neither can it be definitely denied.[2] A

[1] As Sherrington and Grünbaum have pointed out, it is probable that further progress in this field will be made rather by the patient combination of clinical and microscopical research than by excitation experiments in the laboratory.

[2] The case has, however, been reported (Dide, *Rev. Neurol.*, 1901, pp. 446–

consideration which makes it improbable is the high percentage of the frontal lobes to the brain as a whole, furnished by idiots and imbeciles; in Clapham's figures it is scarcely second to that given by even the most intellectual forms of insanity. There is now general agreement that the parietal portions of the brain have a large and perhaps predominant part in the higher intellectual processes. It is mainly by the development of the parietal lobe that man's brain differs from that of the anthropoid apes, and increased surface of the lower part of the parietal lobe has been noted in many men of genius. There is no agreement as to the influence of the frontal regions on the psychic processes. But though it may frequently happen that lesions of the prefrontal area are followed by no mental or bodily symptoms, there are also cases in which injury here is followed by alterations and perversions of character. Ferrier brought together many such cases, and Robert Jones records a case in which severe injury to the frontal region was followed by loss of higher control.[1] The question remains open, though it seems most reasonable to suppose that the whole of the brain is concerned in mental operations, and certainly by no means least the sensori-motor regions of the middle of the brain cortex, of which we have the most detailed experimental knowledge.

These centres are concentrated in the parietal portions of the cerebrum, and there seems now little doubt that they tend to predominate in men. This result was obtained by Broca (though Broca's figures show only a slight preponderance of this region in men), Meynert, Rüdinger, Crichton-Browne, Tigges, etc. There is some reason to suppose that the parietal region is very largely developed in persons of exceptional intellectual power; thus Rüdinger, examining eighteen brains of distinguished men,

62) of a woman who lived a normal life, though she eventually became insane, in whom the frontal lobes were atrophied to an extreme degree; microscopical investigation showed that this atrophy was not acquired but congenital.

[1] F. W. Mott and Robert Jones, *Archives of Neurology*, III (1907).

found that in all of them the parietal lobes were largely developed in the frontal direction. In apes the parietal region is small owing to the incursion both of the frontal and occipital lobes.[1]

It is somewhat doubtful whether the occipital lobe is larger in women than in men; Broca's figures show it to be on an average relatively the same size, in earlier adult age somewhat larger, in old age somewhat smaller; Crichton-Browne found it larger in women; many authorities speak uncertainly, or are inclined to find it larger in men. Cunningham finds it larger in women. It may be added that the general tendency of the occipital lobe in the mammalian series is to decrease; it is relatively smaller in the anthropoids than in the more primitive apes, and is still smaller in Man; on the other hand, it tends to become more convoluted, so that we cannot regard it as in process of atrophy; Gambetta's brain, which was small, was a marvellous example of occipital convolution.[2]

If we turn from the consideration of the sexual differences in the divisions of the cerebrum to the larger and plainer divisions of the brain-mass into cerebrum, cerebellum, and the medulla and axial part of the brain, the points of sexual difference are somewhat clearer, though by no means their significance. The most reliable evidence points on the whole to the cerebellum being relatively larger in women than in men, as stated long ago by Gall and Cuvier. Broca's figures show that to a slight extent the medulla and cerebellum, but especially the latter,

[1] 'It would be an interesting field for speculation,' Cunningham remarks, 'to consider whether this parietal increase in the human brain has anything to do with the acquisition of the educated movements of the limbs — more especially of the upper limbs — and that wonderful harmony of action which exists between the brain and the hands, and which has played so important a part in the evolution of the species.'

[2] Sexual distinctions in the important matter of the vascular supply of the brain have received little attention. Crichton-Browne and Martin made a few observations indicating that the arteries which supply the brain, taken together, are relatively to the brain-mass rather larger in women than in men. So that women's brains would receive a proportionately larger blood-supply than men's, and would not suffer from the comparative poverty which characterises their blood.

are relatively larger in women. Philippe Rey, who has worked up Broca's figures with much elaboration, found that with scarcely an exception all the centres below the cerebrum are relatively larger in women.[1] Boyd's figures show a similar result. Marshall, in an important paper[2] on the weight of the brain and its parts, found that the ratio of the cerebellum to the cerebrum (from Boyd's figures) is in adult males as 1 to 8.17, in adult females as 1 to 8; and he further worked out from Boyd's figures the ratio of the parts of the brain to the whole in decimal parts of an ounce to every inch of height:

MEN

No. of Cases.	Age.	Entire Encephalon.	Cerebrum.	Cerebellum.	Pons and Medulla.
103	30–40	.725	.632	.077	.015

WOMEN

85	30–40	.695	.611	.076	.015

This shows that while men possess relatively to height more cerebrum than women, in the distribution of the lower centres the sexes are equal. It must be added that, in accordance with what has been already said in regard to the brain generally, this cerebellar sexual equality relatively to height really means cerebellar predominance in women. Some of the basal ganglia of the brain, according to Tigges and others, are absolutely as well as relatively larger in women. Putting together numerous facts, it seems clear that the mantle is that part of the brain which is most liable to vary. The cerebellum, the various basal ganglia, and the spinal cord seem to be more constant than the cerebrum; they do not waste to the same extent with age or with insanity.

It is worth noting that the cerebellum in women is rela-

[1] P. Rey, *Revue d'Anth.* (1884), 193.

[2] J. Marshall, *Jour. Anat. and Phys.*, July, 1892.

tively larger than is the cerebrum. But the significance of this fact is at present by no means obvious. There is less to be positively affirmed to-day about the functions of the cerebellum than there was fifty years ago. It has no connection, as was once supposed, with the sexual instinct. Its destruction does not produce either paralysis or loss of intelligence. Professor Rudolf Magnus of Utrecht concludes: 'Unfortunately we know not a single function or reflex positively connected with the cerebellum in such a way that it is absent after cerebellar extirpation, and present after ablation of other parts of the brain, as long as the cerebellum remains uninjured.' [1] It may be added, however, that the cerebellum is a characteristically adult organ; in the new-born child it may only form about one-thirteenth or less of the brain-mass; in the adult it forms about one-seventh. Its development indicates height in the zoölogical scale, and it is relatively largest in Man.

While sexual differences in the brain are at the most small, it would appear that differences in the relative amount of the spinal cord are more marked. At every age investigated, Pfister found that there is more spinal cord, in relation to brain, in girls than in boys; and that compared to stature the cord is heavier in girls than in boys, though it is always slightly shorter in girls.[2] Mies found that, both in normal subjects and in the insane, women have throughout life a larger cord, as compared to the brain, than men.[3] The results obtained by the Collective Investigation Committee of the Anatomical Society of Great Britain [4] go further than this, and indicate that as regards the length of the cord, women tend to show an even absolute superiority. Relatively to the length of the spinal column, the cord is longer in females, and this

[1] *Proc. Roy. Soc., London*, Series B., 98 (1925), 352. For a summary of recent views concerning the possible functions of the cerebellum, see Brain and Strauss, *Recent Advances in Neurology* (1929), chap. X.

[2] *Neurologisches Centralblatt*, 1 Sept., 1903.

[3] *Ctbll. f. Anth.*, Heft 3 (1897), 273.

[4] *Jour. Anat. and Phys.*, Oct., 1894.

greater extension may be a sexual peculiarity. In females, also, there was greater variation than in males; while absolutely longer on the average in women, the longest cord measured was in a woman. Relatively to the average length of the spinal column, from the *foramen magnum* to the base of the sac, the cord is slightly longer in females than in males. This spinal predominance in women (which is also an infantile character, all the fœtuses examined showing a long cord), may possibly be of some significance, since, independently of sex, Man (as Ranke showed) possesses of all vertebrates the smallest spinal cord in relation to brain and in this respect the masculine nervous system appears more evolved than the feminine nervous system.

To sum up, it may be said that investigation has shown that the ancient view which credited men with a significantly larger amount of nervous tissue than women has been altogether overthrown. There is much better ground for the later view, according to which, relatively to size, the nervous superiority belongs to women, just as all small animals have relatively large brains. This is especially marked as regards the lowest nervous centres. The tendency among investigators — as represented by Lapicque, Donaldson, Blakeman, and others — seems to be in favour of regarding any sexual preponderance in the relative mass of total nervous centres as negligible. We should then be justified in concluding with Lapicque: 'The body and brain weights of men and women are exactly in the same relation to each other as if we were concerned with two distinct animal species, equal in their nervous organisation.' [1]

It can thus scarcely be said that the study of the brain from our present point of view leads to the revelation of any important sexual distinctions.[2] In the future, when

[1] Lapicque, *Bull. et Mém. de la Soc. d'Anth. Paris* (1907), 343.

[2] Gustaf Retzius, in his judicial study of the human brain (*Das Menschenhirn*, I, 166–67, Stockholm, 1896) concluded that, while there are no specific or characteristic sexual differences, we may say on the whole that the brains of women show fewer deviations from the type, and a greater simplicity and

the facts are more precisely ascertained, and their significance more obvious than it is now, it may be different. At present it is necessary to insist upon the fact that the importance of the brain has been greatly exaggerated. Its importance, unquestionably, is great, but it is an importance that is strictly related to the brain's very intimate connection with the body generally. We have been apt to regard it as the despotic ruler of the body, whereas, so far as it is a ruler at all, it is a democratic ruler. The brain elements, for the most part, are but sensori-motor delegates brought together for the sake of executive convenience. We must not, therefore, be surprised if we can often better study these cerebral representatives of the organism by investigating the organism itself.

While, however, the brain is at present an unprofitable region for the study of sexual difference, it is, as we have seen, an instructive region for the study of sexual equality. Men possess no relative superiority of brain-mass; the superiority in brain-mass, so far as any exists, may even be on women's side; [1] this, however, implies no intellectual superiority, but is merely characteristic of short people and children. Nor is there any well-marked sexual arrangement of the nervous elements which implies relative inferiority on one side or the other. The parietal predominance of man is possibly such a character, but, as we have

regularity. While most deviations may be found in the brains of women, the percentage of their occurrence is in general smaller. It may be added that Waldeyer, one of the chief German authorities, expressed himself as in agreement with Retzius. It is a result which accords with the results we shall find later in various other fields.

[1] It would be interesting to know how far the same rule applies to the lower animals. In the frog, which has been most carefully studied, Donaldson and Shoemaker (*Jour. Comp. Neurology*, 1900, p. 300) show, in opposition to Furbini, that the female frog has, proportionately to her body-weight, a larger mass of brain than the male. In a later study of the albino rat (*Jour. Comp. Neur. and Psych.*, May, 1909) Donaldson finds that, taking body-weight and length, the weight of the entire nervous system in the two sexes is similar, but the brain is somewhat heavier in the male and the spinal cord in the female; this, as he remarks, agrees with observations on the human nervous system. Hatai (*Am. Jour. Anat.*, 1908, no. 4) finds, similarly, that any sexual difference in the cranial capacity of the albino rat may be accounted for by difference of body-weight.

seen, this predominance is so inconspicuous that it has been possible in the past to attribute it to woman. From the present standpoint of brain anatomy and brain physiology, there is no ground for attributing any superiority to one sex over another. Broca, the greatest of French anthropologists, whose keen and luminous intelligence brought so much light to the study of Man, believed many years ago (in 1861) that women are, naturally and by cerebral organisation, slightly less intelligent than men. This opinion has been very widely quoted; it is not so well known that with riper knowledge Broca's opinion changed, and he became inclined to think that it was merely a matter of education — of muscular, it must be understood, and not merely mental, education — and he thought that if left to their spontaneous impulses men and women would tend to resemble each other, as happens in the savage condition.[1] It must be clearly recognised that in the present state of our knowledge there is no recognisable scientific warrant for the introduction of these considerations as factors in the settlement of the questions of social and practical life.

[1] Discussion at the Paris Anthropological Society, *Bull. Soc. d'Anth.*, 3 July, 1879. It is unnecessary to add that there are limits beyond which such resemblance cannot pass under any savage conditions.

CHAPTER IX

THE SENSES

Touch — Results of Lombroso, Jastrow, Galton, Marro, etc. — Greater tactile sensibility of women — Educability of the tactile sense.

Sensibility to pain — Results of Jastrow, Gilbert, Griffing, etc. — Complexity of the question — Disvulnerability marked in savages, children, and perhaps in women.

Smell — Experiments of Nichols and Bailey, Ottolenghi, Garbini, Marro, etc. — Differences of opinion.

Taste — Investigations of Nichols and Bailey, Ottolenghi, Toulouse, etc. — Sense of taste keener in women.

Hearing — Experiments on keenness of hearing during health few and inconclusive — Range of audible sensation probably greater in men.

Sight — Blindness commoner in men — Minor eye-defects commoner in women — No marked sexual difference in keenness of healthy vision — Colour-perception and colour-blindness — Colour-blindness very rare in women — Also rare among savages.

Coloured hearing — This and allied phenomena more common in women and in children than in men — The confusion between sensibility and affectibility.

TOUCH

THERE can be little doubt that as regards tactile sensibility women are superior to men. The earlier experiments on sexual differences in this respect, made chiefly in Italy by Lombroso and others, for the most part on abnormal subjects, were inconclusive. Later experiments, frequently made with more delicate instruments, have shown that girls and women are distinctly more sensitive to tactual impressions than are boys and men. This is found to be so even in Italy. Even Lombroso, who came to the conclusion that women have a less acute tactile sensibility than men, found that it was highly developed in young girls between the ages of six and twelve. Di Mattei found the tactile sensibility of girls greater than of boys.[1] Ottolenghi, again in Italy, made an extensive examination of individuals of all classes and ages and found that on the whole girls and women are more sensitive than boys and men.[2]

[1] Di Mattei, *Arch. di Psich.* (1901), Fasc. III.

[2] Ottolenghi, *Rev. Sci.*, 28 March, 1896.

Den in Russia, testing sensitiveness to temperature, electric current, and locality, found little sexual difference, but such differences as occurred were in favour of the greater sensibility of women. In Germany, Stern at Munich, among a large number of individuals, found that women are decidedly superior to men in tactile sensibility of the finger, and girls to boys; compositors also showed a very high degree of sensitiveness, while the highest development of tactile sensibility was found in the blind. In England, also, Galton, using compasses applied to the nape of the neck (thus avoiding the results of varying exercise and varying roughening of the skin), found among 1300 individuals that women show more sensitivity than men, the relative sensitivity being, roughly, about 7 to 6. He found greater variability in the women, and attributes this, no doubt correctly, to the fact that women, much more than men, are defective in the exercise of sustained attention; their carelessness would affect the result in the same direction as diminished sensitivity.[1] Galton's measurements were made on a region of the body favourable for such a test, and one also where no extreme precision of measurement is required, the average first-perceptible interval at the nape of the neck being about as much as half an inch. At Chicago Helen Thompson agreed with Galton that women are more keen than men in the discrimination of two points.

Professor Jastrow brought forward a small series of observations on male and female students, which, though not conclusive, had the advantage of being perfectly comparable. The æsthesiometer used was one designed by himself and showed greater sensitivity of the women. An attempt to test the pressure sense showed men and women about equal.[2]

Arthur Macdonald found that on the volar surface of

[1] F. Galton, 'The Relative Sensitivity of Men and Women,' *Nature*, 10 May, 1894.

[2] 'Studies from the Laboratory of Experimental Psychology of the University of Wisconsin,' *Am. Jour. Psych.*, April, 1892.

wrists girls are more sensitive to locality than boys both before and after puberty, which in both sexes appeared to lead to decreased sensitivity. These results seemed to require modification in the case of adults, but the number of subjects was here very few.[1]

It may be added that Marro's observations on the sensibility of the tip of the index-finger, between the ages of ten and twenty, showed that after fourteen the boys were more sensitive, though before fourteen the girls were more sensitive. In another but very small series, in which, however, the ages were higher, he found the women superior. He recognised the influence of defective attention, and also, he believed, imperfect oxidation, as tending to decreased sensibility in women.[2]

It must be borne in mind that tactile sensibility is more variable and more educable than we are always inclined to assume. Dr. Pauline Tarnowsky's investigations into the senses of normal women, criminal women, and prostitutes in Russia showed that women who live in towns have keener senses than women who live in the country; thus while criminals as a rule have more obtuse sensory perceptions than ordinary persons, she found that town-dwelling thieves had a much keener sense of taste than honest peasant women who had never lived in a town.[3] Felkin made some interesting observations bearing on the same point in 150 Negroes and 30 Sudanese Arabs, and found that the power of discrimination, as against 1.1 mm. on tip of tongue in Europeans, was 3 mm. in the Negroes and 2.6 mm. in the Sudanese; but after two Negro boys had been educated in Europe for four years, tactile sensibility became more acute and they could discriminate at 2 mm.[4] Again, Krohn found that the skin can be progressively educated to localise sensations of pressure more and

[1] A. Macdonald, *Psych. Review*, March, 1896. [2] Marro, *La Puberté*, 57.
[3] *Actes du Troisième Congrès International d'Anthropologie Criminelle* (Brussels, 1893), 226.
[4] Felkin, *Brit. Assoc. Report*, 1889.

more correctly and that this improvement from practice is very rapid.[1] The education of the skin by means of the æsthesiometer was also studied by Dressler.[2]

SENSIBILITY TO PAIN

Jastrow made some attempts to measure sensitiveness to pain in male and female students, using a light hammer pivoted at a point 200 mm. from its iron head, and allowing it to fall on the tip of the forefinger of each hand; both finger and hand were supported. The minimum number of degrees through which the hammer must fall in order to cause a painful sensation was found to be surprisingly constant, and, as might be expected, it was much smaller in women. It is noteworthy that as regards the left hand men and women are more nearly equal, but that there is a very considerable disproportion as regards the right hand, apparently indicating the rough usage undergone by the right hand. Macdonald found, with an algometer of his own design applied to the temples, that girls and women are at all ages more sensitive to pain than boys and men; there was in general decreased sensibility with age, and the left temple (as well as the left hand) was more sensitive than the right. The non-labouring classes in both sexes were more sensitive than the labouring classes.[3] Ada Carman, using Macdonald's algometer, reached similar results in a series of experiments with 1500 school children in Michigan.[4] Swift, at the Wisconsin State Normal School, also using Macdonald's algometer, found that sensitiveness to pain in the temples is at nearly all ages investigated greater in females than males; he also found that this greater sensitiveness of women is an infantile character, as it is most marked in young children and decreases with age; he further found that sensitiveness to pain is associated with nervous superiority, children of 'excel-

[1] W. O. Krohn, *Jour. Nerv. and Mental Disease*, March, 1893.
[2] *Am. Jour. Psych.*, June, 1894.
[3] *Psych. Rev.*, 1896 and 1898.
[4] *Am. Jour. Psych.*, April, 1899.

lent' ability being more sensitive to pain than those who were 'dull.'[1] Gilbert, again, among Iowa school children, tested the pain threshold, using an algometer which exerted pressure on the nail of the right index-finger; it is claimed for this method that it not only obviates the difficulty due to varying callosity of the skin, but that there is a definite point at which pressure gives way to pain. It was found that boys are always less sensitive, and that there is a gradual decrease of sensibility throughout from the ages of six to nineteen. The average difference between the sexes continued about the same up to the age of thirteen, but after that age, while the girls remained almost stationary, retaining their youthful sensibility, the boys progressively lost sensibility.[2]

It would thus appear that we are justified on the whole, so far as exact measurements can be trusted, in concluding that women are more sensitive to pain than men. The matter is not altogether simple. As is remarked by Helen Thompson, who with a spring algometer found women more sensitive to pain in the temples, it depends on the individual's idea of 'pain.' And as Griffing remarks, as the result of experiments with Cattell's pressure algometer and with the induction coil, there is no necessary conformity throughout the body, so that a high pain threshold for the hand is not necessarily associated with a similarly high threshold for the forehead. Moreover, sensibility to electric stimulus is quite independent of pressure sensibility.[3]

It would appear that, on the whole, sensibility to pain, in its sexual variations, corresponds to the general tactile sensibility. It is, however, not a satisfactory test to carry out, nor are its results easy of interpretation. On this account there is still some difference of opinion as to whether men or women are more sensitive to pain. In

[1] E. J. Swift, *Am. Jour. Psych.*, April, 1900.
[2] Gilbert, *University of Iowa Studies in Psychology* (1897), 11.
[3] H. Griffing, *Psych. Rev.*, July, 1896.

Italy, Ottolenghi, who found general sensibility more acute in women, found sensibility to pain more acute in men. He used Edelmann's faradimeter on the moistened back of the hand. His results show increase of sensibility to pain up to the twenty-fourth year, after which age women showed three times as many cases of obtusity as men. He admits, however, that the matter is somewhat complicated by a greater 'resistance to pain' on the part of women, and at one school some of the girls, in a spirit of bravado, refused to admit pain up to the extreme limit of the faradimeter.

The question of the relative sensitiveness to pain of men and women has usually been settled by the consideration of data of a more general character. There are numerous facts and statements tending to show that women are less affected by pain and suffering than men. Sergi considers that the fact that women suffer less is shown by their greater resignation, unless it be claimed that women possess greater strength of will; and he points out that men who nurse their relatives rapidly lose flesh and health, while women, even mothers, often retain their good humour and appetite.[1] A professional tattooer has stated that 'ladies have much more courage and bear pain much better than men, though I must tell you that tattooing, if scientifically done, is all but painless. However, men are much more fidgety than women, who keep perfectly quiet.' Bouchet, an observant old French writer of the sixteenth century, remarks that women endure cold better than men, and do not need so much clothing.[2] The same remark is often made to-day.

Some light is perhaps thrown on the matter when we turn to the closely allied question of disvulnerability in the two sexes. Disvulnerability is the term first used by Benedikt to signify quick repair of wounds and comparative

[1] Sergi, *L'Anomalo*, Oct., 1891. Sergi examined emotional rather than organic sensibility.

[2] *Serées*, I, 15. The real explanation of this fact, however, is that women possess a natural garment of fat: see *ante*, p. 152.

freedom from ill consequences after severe injuries. Among the lower animals there is a high degree of disvulnerability. Among savages it is everywhere well marked, and is associated with a measurably high degree of insensibility. The Zanzibaris, for instance, have a wonderful power of repair of wounds,[1] and Reyburn, from an analysis of the cases of over 400,000 Negro patients treated by the medical department of the American Bureau of Refugees, from 1865 to 1872, found that the Negro has greater reparative power after injuries and other surgical operations than the white man. Among different races there appears to be a varying degree of resistance to pain which does not seem necessarily related to the evolutionary scale of the race. Pirogoff, the distinguished surgeon, observed that Jews, Mussulmans, and Slavs bore pain well. Sir William McCormac observed that the Turks exhibit total indifference to suffering.[2]

The cheerfulness of children when patients has often attracted attention.[3] Malgaigne, the French surgeon, first showed in 1842 that children from the age of 5 to 15 bear amputation better than adults, a result which has since been confirmed, and is now generally recognised; we may accept Horsley's statement that 'as far as operative measures go, there is no doubt whatever that the nervous system of the child is less influenced by traumatism than that of the adult.' Malgaigne further showed that women bear amputation better than men, a conclusion which has also been confirmed. Legouest has united the figures of Malgaigne of Paris, Laurie of Glasgow, Fenwick for Newcastle, Glasgow, and Edinburgh. In a total of 1244 cases of amputation in men the deaths were 35.45 per cent, in women, 29.29 per cent, a considerable difference in favour of women.[4] According to one table, the difference in

[1] T. H. Parke, *Experiences in Equatorial Africa*, 435.

[2] McCormac, Art. 'Gunshot Wounds,' Heath's *Dictionary of Surgery*.

[3] For instance, see Dr. A. B. Judson in his presidential address to the American Orthopædic Association at Washington in 1891.

[4] Art. 'Amputations,' *Dict. Ency. des Sciences Médicales*.

favour of women is as much as 16.2 per cent. It may be argued that the difference is due to the more serious character of the accidents to which men are liable; but the difference is marked not only in amputations due to injuries, but also in those occasioned by disease. It is possible that we here have a sexual difference connected with the well-recognised resistance to death shown not only at birth by female infants, but in old age by the greater longevity of women.

In a paper by Lombroso on 'La Sensibilité de la Femme,' read at the International Congress of Experimental Psychology (1892) in London, various arguments were brought forward in favour of the greater sensory obtuseness of women and their greater disvulnerability. The paper is not rich in precise details, and is open to criticism. The following passage may be quoted: 'Billroth experimented on women when attempting a certain operation (excision of the pylorus) for the first time, judging that they were less sensitive and therefore more *disvulnerable* — i.e., better able to resist pain. Carle assured me women would let themselves be operated upon almost as though their flesh were an alien thing. Giordano told me that even the pains of childbirth caused relatively little suffering to women, in spite of their apprehensions. Dr. Martini, one of the most distinguished dentists of Turin, has informed me of the amazement he has felt at seeing women endure more easily and courageously than men every kind of dental operation. Mela, too, has found that men will, under such circumstances, faint oftener than women. Proverbs of different peoples confirm the fact of women's capability of resisting pain — e.g., "a woman never dies, has seven skins, has a soul and a little soul," etc.' [1]

[1] The same arguments are more fully stated and developed in Lombroso e Ferrero, *La Donna Delinquente* (1893), 58–66. See also Dr. H. Campbell's *Nervous Organisation*, etc., 54–55, 118. Campbell points out how well women bear both loss of blood and loss of sleep, and remarks, 'Nothing has surprised me more than the extraordinary resignation, almost it would seem apathy, with which many women endure physical suffering, and face impending death.'

With regard to the statement attributed to Professor Billroth, I wrote to Professor Eiselsberg, who was then the celebrated Viennese surgeon's chief assistant, and, in substance, he confirmed Professor Lombroso's statement: 'Professor Billroth really thinks that for all operations of the abdomen women have more resistance, so that operation on them gives more chance of recovery.' This opinion, from so high an authority, although unaccompanied by statistics, is entitled to attention, and it harmonises with the recorded results of amputation. The sexual difference cannot be great, since many eminent surgeons (Sir James Paget, for example) have not observed it; but it seems to be real. Marcel Baudouin quotes German statistics showing that in a large number of cases of gastro-enterostomy the mortality among men was 54 per cent, among women only 35 per cent; while in a number of cases of pylorectomy it was 64.3 among men to 52.8 among women.

While the experimental evidence on the whole goes to show that sensibility to pain as well as general tactile sensibility is more acute in women than in men, it must be admitted that the former sensibility is of a more complex character than the latter, and in its determination we encounter elements which do not truly belong to the region of sensibility proper. According to some observers, as we have seen, it appears that even if women feel pain sooner, they have a greater resistance to pain than men, and are less affected by it. It is possible that, notwithstanding their greater nervous irritability in most respects, women are really better able than men to resist pain and discomfort. The social life of woman, her subordination to parents and husband and children, the duty of submission and concealment imposed upon her, have all tended to foster tolerance of pain. It is reasonable to suppose that women would not have so generally fallen into this rôle unless there were some organic basis which made it more natural and less arduous than it would be in man. We

shall approach this problem from another point of view when we come to consider the affectibility of women.

SMELL

Sexual differences in keenness of smell were first accurately measured by Professors E. H. S. Bailey and E. L. Nichols. In the 'Proceedings' of the Kansas Academy of Sciences for 1884 there is a paper by Bailey showing that with regard to many common odours delicacy of perception is much more marked among men than among women. I have not seen this paper; but in 'Nature,' 25 November, 1886, a letter from Nichols and Bailey briefly summarised their methods and results. They made use of the following substances: (1) Oil of cloves, (2) nitrite of amyl, (3) extract of garlic, (4) bromine, (5) cyanide of potassium. A series of solutions was prepared of which each member was half the strength of the preceding one. They were extended in successive dilution till it was impossible to detect the substances by their odours. The bottles were then placed at random for the subject to classify by the sense of smell. In the first series of experiments there were 17 males and 17 females. The results may be expressed in the following table, which gives the amount of each substance detected:

Average of males.	Oil of cloves. 1 part in 88,218 of water.	Nitrite of Amyl. 1 in 783,870.	Garlic. 1 in 57,927.	Bromine. 1 in 49,254.	Cyanide. 1 in 109,140.
Average of females.	1 in 50,667 of water.	1 in 311,330.	1 in 43,900.	1 in 16,244.	1 in 9,002.

A second series of experiments was subsequently made on 27 males and 21 females, with the following results:

Average of males.	Prussic Acid. 1 part in 112,000 of water.	Oil of lemon. 1 in 280,000.	Oil of wintergreen. 1 in 600,000.
Average of females.	1 in 18,000 of water.	1 in 116,000.	1 in 311,000.

Three of the male observers were able to detect one part of prussic acid in about 2,000,000 parts of water — two of these persons, however, were engaged in occupations favouring the cultivation of this sense — when the most careful chemical tests failed to reveal the acid. On the other hand, some of both sexes could not detect prussic acid even in solutions of overpowering strength. 'Our average shows,' the investigators conclude, 'that the sense of smell is much more delicate in the case of male than of female observers.' Some years later, Professor Nichols (then of Cornell University), in reply to various queries which I addressed to him, wrote that neither he nor Professor Bailey was in any degree expert in the physiology of the senses. 'His interest in the matter lay in its bearings upon chemistry, mine in its relation to physics. The points of sexual difference met with were not looked for in planning our experiments. They were, almost without exception, just the opposite of our preconceived notions concerning such differences. The number of individuals tested was probably insufficient to enable one to draw very broad conclusions. We deemed the differences worthy of record, however, to be given such weight as their limited character would justify. As to the class of individuals tested: they were almost entirely students of the University of Kansas, a co-educational institution of fair grade, which at that time contained nearly equal numbers of young men and women. Ages chiefly 17 to 25 years.'

Ottolenghi, in the Laboratory of Forensic Medicine of Turin University, made a series of observations on 30 normal men and 20 normal women (of the middle and lower classes), none of whom took tobacco or presented any disorder of the nasal passages; at the same time he experimented on 80 criminal men and women. He constructed a kind of osmometer with twelve aqueous solutions of essence of clove, and in most respects he followed the methods of Nichols and Bailey. Essence of clove was

selected as being a very odorous substance, very fractionable, and well known. He found that olfactory acuteness was slightly less in women than in men.[1] Ottolenghi's conclusions have been criticised by Garbini, who remarks that they are scarcely supported by Ottolenghi's own figures. Garbini has himself studied the evolution of the sense of smell in 400 young children, and finds that olfactory sensibility is both greater and more precocious in girls than in boys.[2] This difference is, however, on the average very small, and it decreases with age, so that at the age of six boys and girls are practically equal. As Binet has remarked in criticism of Garbini's conclusions, we cannot regard them as proving that women are superior to men in olfactory acuteness; they may be merely due to the greater precocity of girls. It must be added that Di Mattei, among children between the ages of four and twelve, is in agreement with Garbini in finding that the sense of smell is superior in girls. The results reached by Toulouse and Vaschide point in the same direction, as also do those of Helen Thompson in Chicago, experimenting with violet water and oil of cloves, but the superior sensitiveness of women was less marked than as regards taste.

Marro also, who investigated this question with some care on a large number of children and young people in the north of Italy, using Zwaardemaker's olfactometer, found that the sense of smell is generally more acute in women, and more so after puberty than before. He considered that this sense is developed in association with the sexual activities of women, and that its development at puberty is connected with a relatively decreased acuteness in the other senses.[3]

So far as it goes, the evidence furnished by experiment is not at present very clear. Cases of excessively acute keenness of smell certainly occur not very rarely in women,

[1] *Archivio di Psichiatria* (1888), IX, Fasc. 5.
[2] Garbini, *Arch. per l'Antrop.* (1896), Fasc. 3.
[3] Marro, *La Puberté*, 59.

perhaps much more frequently than in men, but they seem usually to occur in young hysterical women. Even if there is no clear evidence of a greater measurable sensitivity to odours in women generally there seems little doubt that women tend to be specially interested in odours. This emotional affectibility is often traceable in novels and poems by women.[1] The possibility that women are not very sensitive to odours is often suggested to men by the perfumes of oppressive strength which women are apt to use.[2] It is interesting to note that the abuse of perfumes by women is not confined to modern times. In the *Pædagogus*, that delightful manual for the use of semi-pagan Christians, I remark that Clement of Alexandria supplies an indication that in his day masculine nostrils seemed more sensitive than feminine. In permitting a limited use of perfumes, he says, 'Let a few unguents be selected by women, such as will not be overpowering to a husband.'[3]

TASTE

Men have a monopoly of the higher walks of culinary art; women are not employed in such occupations as tea-tasting, which require specially delicate discrimination; they are rarely good connoisseurs of wine; and while *gourmandes* are common, the more refined expression *gourmet* does not even possess a feminine form. On these grounds it has sometimes been asserted that the sense of taste in women, like the sense of smell, is not so highly developed as in men. This conclusion has not, however, been justified by accurate investigation.

The sexual differences in the sense of taste, like those in

[1] This point is further considered in the discussion of smell in *Studies in the Psychology of Sex*, IV.

[2] I do not wish to imply that the love of strong perfumes is itself proof of deficient sensitiveness with regard to smell. It must be remembered that the use of perfumes has often been inculcated in women as a method of covering more natural odours.

[3] Bd. II, chap. 8, 'On the Uses of Ointments and Crowns.'

the sense of smell, seem to have been first accurately measured by Bailey and Nichols.[1] They made a series of strong solutions for the different classes of sapid substances: for bitter, quinine was selected (1 part in 10,000 parts of water); for sweet, cane-sugar (1 part in 10 of water); for acid, sulphuric acid (1 in 100); for alkaline, sodium bicarbonate (1 in 10); for saline, common salt (1 in 100). By successive dilutions each of these solutions became the strongest of a series of solutions, each member of which was one half the strength of the preceding one. The bottles containing the solutions were then placed without regard to order, and the person experimented upon was requested to taste them and separate them into their proper groups. In each series the last solution was so dilute as to be unrecognisable. The experimenters concluded that the sense of taste is more delicate in women than in men. This was true in the case of all substances excepting salt. 'As we had found a similar difference,' the writers remark, 'in an earlier and independent set of experiments, which agreed in every essential particular with the results of the present test, we do not regard it as an accidental difference, or as likely to disappear in more extended investigations.' They noted that wide individual differences presented themselves, and that these variations were not explicable as results of education, men with great experience in handling drugs being surpassed by women without any such training. In a few cases the ability to detect a dilute sweet was accompanied by an inability to detect a dilute bitter.[2]

Shortly afterwards the question was independently investigated by Ottolenghi at Turin.[3] He experimented on

[1] *Science* (1888), 145.

[2] Subsequently Bailey tested the sense of taste among Indians in a similar way; he found that the order of delicacy is about the same as in white persons, but that the ability to detect dilute solutions is less among the Indians. The sexual differences were the same as among the whites; males had a more delicate sense for salt, while in other respects the females possessed a more delicate organ. (*Kansas University Quarterly*, 1893.)

[3] *Archivio di Psichiatria*, X, 332–38.

190 persons of both sexes and different classes; all healthy and of robust constitution, the greater part between the ages of 20 and 50. He experimented with bitter, sweet, and salt sensations. For the first he selected sulphate of strychnine, and found that 12 per cent of his normal persons perceived one part in 800,000; setting out from this strength he made eleven graduated solutions, the strongest being 1 part in 50,000; as a sweet substance, in place of sugar, which is not very divisible, he used saccharine, making eleven gradations between 1 in 100,000 parts (which could be tasted by 25 per cent of the normal men and 45 per cent of the normal women) and 1 in 10,000; the eleven common salt solutions ranged from 1 to 500 to 3 in 100. Numerous precautions were taken: the mouth was well rinsed with lukewarm water; each experiment was repeated, and control experiments with distilled water were made to avoid the disturbing influence of expectation and subjective sensations; the solutions were kept at the temperature of the air. In making the test the solution was squirted onto the tongue from a pipette, and care was taken that the amount should always be the same. Ottolenghi presents his results in a table which divides the subjects into three groups (indicating delicate, middling, and obtuse sensations) under each head of 'bitter,' 'sweet,' and 'salt'; the table is so arranged that it also presents the percentage of individuals in relation to each solution. Speaking generally, the criminals, more especially the male criminals, showed a very small proportion of persons with delicate sense of taste; the professional men showed keen sense of taste; in regard to bitter, for example, there were 54 per cent professional men in the class showing delicate perception, as against 15 per cent criminals. The males of low social class came midway between professional men and criminals, but nearer to the criminals. The criminal women may be said to rank with the men of low social class, while the normal women on the whole rank with the professional men. Ninety per cent of the

normal women possessed refined taste as regards salt, against 80 per cent of the professional men, the difference in favour of women being marked in the case of the weakest salt solution (90 per cent of the women to 40 per cent of the professional men); this result is in curious contrast, it is worth while to note, to the exceptional delicacy as regards salt possessed by the men investigated by Bailey and Nichols.

Ottolenghi considers that his results show that men and women possess nearly equal acuteness as regards all three tastes, but he believes that if other conditions were equal, and male habits of smoking and drinking were taken into account, it would be found that men possess a more delicate sense of taste. It may be seen, however, that an examination of Ottolenghi's clearly reported results does not justify this conclusion. No evidence is brought forward to show that alcohol and tobacco — as used temperately by average students and professional men — produce any degeneration of the gustatory apparatus, while the observations of Bailey and Nichols bring no support to this view. Moreover, the influence of social class, as shown by Ottolenghi's males, is so evident and so marked that it is obvious we ought to know to what social class his 'normal women' belonged. If they belonged to the same class as the students and professional men, then the evidence as presented by Ottolenghi simply shows that men and women are equal in this respect. It is much more probable, however, that the women chiefly belonged to a much lower social class and were more nearly comparable to the males of very low social class.[1] If so, Ottolenghi's results may be said to support those of Nichols and Bailey.

Di Mattei investigated gustatory acuteness among Italian school children, and found that girls are more sensitive to sweet sensations, boys to bitter, while the sexes

[1] This seems to be indicated in Ottolenghi's remark — interesting also from another point of view — that among the normal women were some who were 'given to vices and debauchery,' and that these showed a percentage of obtuseness at least as great as that shown by the criminal women.

were equal as regards salt solutions. In Russia, Den found that, both among the educated and the uneducated, women have a more delicate sense of taste than men. In Paris Toulouse also found gustatory sensation more acute in women, except as regards salt solutions, for which (like Nichols and Bailey) he found that men are apparently more sensitive. Using the Toulouse-Vaschide gustatory æsthesiometer, Vaschide investigated the perceptible minimum of gustatory sensations and concludes that for salts the sensibility of men is greater than that of women in a marked degree and in a less degree for bitters, but that as regards sweets and acids there is little sexual difference. In the recognition of taste-odours, women were superior. Of ten taste-odours men recognised on the average 6.42, women 7.46.[1]

In the United States Helen Thompson found that women perceive tastes more quickly than men, but that men discriminate them more accurately. She observes that such power of discrimination is by no means necessarily associated, as is commonly supposed, with quick sensory perception, but may be connected with a more obtuse perception.

HEARING

Deafness (which is usually due to inflammation of the middle ear) is, in the opinion of nearly all authorities, decidedly more common in men than in women. Marc d'Espine found 97 deaf men to 67 deaf women; Zaufal found 698 men to 451 women. It is probable that the sexual difference, though real, is small. Thus the Report on the Deaf issued by the United States Bureau of the census in 1906 showed that in the United States among the deaf the proportion of males is 52.5 per cent while among the general population males are 51.1 per cent; among those born deaf the proportion of males was 53 per cent.

[1] Vaschide, Art. 'Gout' (a comprehensive study), Richet's *Dictionnaire de Physiologie*, VII (1907).

I am not acquainted with many extended and reliable series of observations bearing on sexual differences in sensitiveness to sound during health. Roncoroni examined 20 healthy men and 15 healthy women from this point of view, and found the advantage in keenness on the side of the men.[1] Among the insane he found hearing nearly equal in men and women.[2] Jastrow published a brief note concerning an attempt to determine from what height a shot weighing 10 mgmm. must be dropped upon a glass plate so that the sound might be heard by the subject at a distance of 25 feet. It was impossible to secure absolute and constant quiet, but the hearing of the women was decidedly more acute than that of the men, the results being 17 and 35 mm. respectively.[3] On the other hand, again, Mabel Nelson, experimenting with the electric tuning fork on 20 men and 20 women, students of California University, in a room specially constructed to exclude noise, found that the men could hear at a considerably farther distance than the women, only one woman excelling the average man, and the poorer ear of the men being much keener than the better ear of the women.[4]

Thus these observations, so far as they go, lead to distinctly opposite results.

In regard to range of audible sensation, Galton, using his whistle at the Anthropometric Laboratory at South Kensington, found that 18 per cent males could hear the shrillest test-note as against only 11 per cent females; and that 34 per cent males heard the next shrillest test-note as against 28 per cent of the females. This result harmonises with what we know of sight. It should be added, however, that Brüner, using the Edelmann type of Galton

[1] *Archivio di Psichiatria* (1892), Fasc. I, 108, 109.

[2] It is interesting to note that, in harmony with these results, Anna Petersen and E. A. Doll (*Training School Bull.*, Dec., 1914), as regards sensory discrimination generally, found in normal children a superiority of boys, but in defective children a slight superiority of girls.

[3] *Amer. Jour. Psych.*, April, 1892.

[4] *Psych. Rev.*, Sept., 1905.

whistle, found that women have a greater range of hearing than men.[1]

It is worthy of note that pianoforte tuners are usually men. I am not aware whether this is owing to the inability of women to rival men in this field. It may, however, be remarked that among young children (under six) in Westfield, Massachusetts, Monroe found that ability to learn and sing the scale is much more marked in girls than in boys (58 per cent girls against only 34 per cent boys), while interest in music was much greater in girls than in boys, and increased with age, while that of boys diminished with age.[2]

SIGHT

Blindness in England is much more common among males than among females at all ages up to 75; the preponderance of women after this age is due simply to the greater longevity of women. The excess of males is most marked at the working period of life and is merely due to greater liability to occupational accidents. It does not seem to be true, however, that minor defects of sight are more common in men. Thus Brudenell Carter analysed his notes of 10,000 cases of disease or disturbance of the eyes in his own private practice, and found 4621 males to 5379 females; this is over 600 more females than there would have been had his patients been in exact ratio to the general population. This distinct preponderance of women and girls is not to be explained, Carter pointed out, by special proclivity on the part of women to any single form of eye-disease. He was 'inclined to refer it to the greater sensitiveness of the female sex, to the more sedulous employment of their eyes over a variety of sedentary occupations, and to their weaker muscles, which are less able, as a rule, than those of men to maintain prolonged efforts of accommodation or of convergence.' [3]

[1] F. G. Brüner, *Psych. Bull.*, 15 June, 1905.

[2] W. S. Monroe, *Ped. Sem.*, March, 1903.

[3] *Lancet*, 29 Oct., 1892.

A number of investigations have been made in schools in various countries, with the special object of determining the prevalence of eye-defect among school children, and the more extensive and reliable of these investigations show a preponderance of the short-sighted among girls which is much more marked than among Carter's patients. Thus among 11,000 boys in Sweden, Axel Key found that short-sightedness ranges from 6 per cent at the age of 11 to 37.3 per cent at the age of 19. But among 3000 Swedish girls he found that short-sightedness ranged from 21.4 per cent at the age of 10 to 50 per cent and over at the age 20.[1]

In America West examined eyesight in the public schools of Worcester, Massachusetts, using Snellen's test-types for the younger children, the Galton eye-test for those in the higher grades. In all the nine grades, except the first, which included the youngest children, it was found that the percentage of defective eyes was distinctly greater among the girls, the difference usually being over 10 per cent; but among boys the defect seemed to be more serious in a larger number of cases.[2] F. Warner's observations in England, based on an examination of 60,000 school children, also showed that serious eye defects are more common in boys.[3]

In 1902 eight oculists were appointed to examine the eyesight of the children in London Elementary Schools (14,000 boys and 13,000 girls). The report of the medical officer to the London schools, Dr. James Kerr, shows that among these children, who were between the ages of eight and twelve, the percentage with defective vision was at every age decidedly greater in the girls than in the boys. When the children were divided into two groups — precocious (younger than the average age in their standard) and retarded (older than the average) — the sexual difference was still invariably maintained, though the retarded

[1] *Die Pubertätsentwickelung*, etc., 30, 61.
[2] *Am. Jour. Psych.*, Aug., 1892. [3] *Brit. Med. Jour.*, 25 March, 1893.

group showed more defective vision than the precocious group.[1]

When we turn to more special investigations into the relative keenness of sight of men and women, the data at hand are limited. The examination at Bath of members of the British Association, by means of Galton's test, revealed little sexual difference; the men had rather better sight with the right eye, the women rather better sight with the left. At his Health Exhibition Laboratory Galton found that men are generally slightly superior to women in keenness of vision. Jacobs and Spielmann found that the English Jewess is decidedly superior to the English Jew in keenness of sight, both in the average and in the maximum and minimum; they are in this test above both the male and female as tested at the Health Exhibition by Galton.[2]

Jastrow made some observations on a small number of male and female students of Wisconsin University.[3] The distance at which a printed page could be read with maximum strain was found to be slightly greater in the men, but the difference was too slight to be of any significance; the nearest point at which the type could be read was also almost identical.

As regards acuteness of vision, it was found that a series of lines 1 mm. wide and separated by spaces of 1 mm. could be discerned at a distance of 117 inches by the men, of 97 inches by the women; a similar determination with a checkerboard pattern, both black and white squares being 4 mm. square, gave 121 inches for the men, 124 inches for the women; and it was found that irregularly arranged dots could also be counted at about the same distance by both men and women, although when the dots became rather numerous the men had a slight advantage. Helen Thompson at Chicago found, on the whole, that, though women were better than men in colour vision,

[1] *Brit. Med. Jour.*, 14 March, 1903.
[2] *Jour. Anth. Inst.*, Aug., 1889.
[3] *Am. Jour. Psych.*, April, 1902.

men were rather better in brightness vision and more sensitive to light.

Taking the evidence as a whole, we may conclude that in most, if not all, civilised countries women are more liable to the slight disturbances of eyesight, due to defective accommodation, which are peculiarly associated with civilisation; [1] while men are probably more liable to serious eye-defects. If, however, we take men and women belonging to the healthiest classes of the community and test the strength and acuteness of their vision, there is found to be no marked sexual difference.

Such a result is in accordance with what we know concerning the visual acuity of savages. At present our knowledge is imperfect, but so far as it goes it tends to show that 'in a state of nature there is no marked sexual difference in visual acuity.' [2]

COLOUR-PERCEPTION AND COLOUR-BLINDNESS

Newton was able to make out seven colours in the spectrum. Those who possess this power can see a dark blue band between blue and violet, and they also see a broader orange band than ordinary people; they are always fond of colour. Green has found only three persons who saw the seven colours (and considers they are about 1 in 2000 or 3000 individuals); they were all males.[3] Nichols made some interesting experiments as to sexual differences in the sensitiveness of the eye to faint colour.[4] The pigments selected were red lead, chromate of lead, chromic oxide, and ultramarine blue, mixed in a graduated way with white magnesium carbonate, and the observer was requested to arrange

[1] Animals furnish a confirmation of the association of eye-defects with civilised conditions. Motais, in a contribution to the Paris Academy of Medicine, stated that having examined the eyes of wild beasts, captured after they had reached adult age, he found them normal; those captured earlier, and still more those born in captivity, were short-sighted.

[2] W. H. R. Rivers, in *Reports of the Cambridge Anthropological Expedition to Torres Straits*, II, Part I, 28.

[3] *Colour-Blindness*, 103.

[4] *Am. Jour. Sci.*, XXX (1885), 37–41.

them according to hue and degree of colour-saturation. The individuals examined were 54 in number (31 males and 23 females), mostly between the ages of fifteen and thirty. Five were more or less colour-blind, but this defect was not found to injure in a marked way their ability to classify the colours. The average male observer was measurably more sensitive to red, yellow, and green, while the average female showed superiority in blue. The light reflected by pigments, as Nichols points out, is not monochromatic, so that these results cannot be held to show us accurately the relation of the eye to the pure spectrum. The individual variations were very great: 8 persons (5 males and 3 females) could distinguish yellow in a mixture of 3 parts in 100,000,000; while 2 (both females) could only detect it in a mixture containing 190 parts to 100,000,000. The lack of delicacy with respect to green was a general trait, possibly, remarks Nichols, traceable to familiarity with foliage. In arranging the phials in order in the series, women on the average were superior to men, though the two nearest approaches to complete accuracy were both men.

Helen Thompson, at Chicago University, using squares of coloured paper, found that women could recognise colours at a greater distance than men, men's record being better only in regard to yellow. Mabel Nelson, at California University, using a more precise method (a glass spectrophotometer illuminated by a Welsbach burner) reached entirely opposed results, and she considers that Miss Thompson's men were abnormally weak in colour-perception. She found that women are in general less keen in the perception of colour, yellow and violet being the only colours in which they seem to excel, and in these only with one eye; in the recognition of blue men were clearly superior.

It would be interesting to consider whether special delicacy in discrimination of a colour is accompanied by special preference for that colour, or the reverse. Winch

in a detailed study among London school children [1] found that both boys and girls put blue first as their favourite colour, red usually coming second; the boys at the outset tend to put red rather higher than the girls, but with age there is a decreasing love of red. The youngest boys of all preferred red and yellow, the youngest girls, red and blue. With age there was a decreasing love of yellow and an increasing love of green, specially marked in the girls among whom in the end green has second place. It was also noted that love of green was most marked in schools of higher social class. Barnes found in California that more girls select red, more boys blue, and remarks, 'this would indicate that girls are more mature than boys on an average.' There seems little doubt that in America red is most often the favourite colour selected by women, blue by men. Thus Jastrow found at Chicago that, among 4500 adults, of every 30 men, 10 voted for blue and 3 for red; while of every 30 women, 5 voted for red and 4 for blue. Wissler obtained somewhat similar results among students in New York, but at Wellesley College blue was preferred to red. There is a much greater range in women's preference for colour, and they prefer green (which Aars in Germany found a favourite colour among young girls) much oftener than men. Lobsien at Kiel among nearly 300 school-girls aged 8 to 14, whom he investigated with much elaboration, found that red is at all ages the easiest colour to recognise and name, blue (except occasionally for the younger children) proving equally easy, orange, violet, and indigo coming last. A majority of the girls preferred red to blue at all ages, the eldest girls (13–14) alone excepted; among these only 38 preferred red to 42 for blue. This is opposed to the conclusion reached by Barnes, and would indicate that the preference for red over blue is an infantile characteristic. There is also on the whole a progressive tendency to prefer green to red, much more pronounced, however, at 10–12 than at

[1] *Brit. Jour. Psych.*, Dec., 1909.

13–14. There is at the same time no progressive preference for red over yellow. Yellow is always much preferred to orange, as also is red. The influence of puberty on colour preference cannot be clearly detected in Lobsien's data. Among the Slavs (Russians, Servians, Bulgarians), Prince Wiazemsky found that boys like red, girls blue. They all tend to like green and dislike yellow.[1] Garbini in Italy made a very elaborate and careful study of the evolution of the colour-sense in 600 children, taking note of sexual differences. He adopted two methods, one in which the child had to match the colours, and another in which he had to name them. By the first, or mute method, boys were a little superior in the third year, they were equal with girls in the fifth, and in the sixth year the girls were decidedly superior. By the second or verbal method, the girls were markedly superior in the fifth and sixth years; older children were not investigated. Girls were found more precocious than boys.[2]

In America Gilbert tested the colour discrimination of a large number of New Haven school children between the ages of six and seventeen. His examination was confined to one colour, and the test consisted of ten shades of red closely graded. The advantage was slightly in favour of the girls, but the curves for the two sexes cross and recross very frequently. The boys are ahead at six, but at seventeen, when the curves end, the girls take the lead. A general average for all ages gives a very small advantage for the girls. But they have an additional advantage in that only 18.7 per cent of them failed to discriminate at all, while 22.3 of the boys failed in so doing.[3] The girls, probably from greater familiarity with the matching of colours, had a slight advantage in this test, which was of too limited a character to be quite conclusive.

[1] See also H. Ellis, 'The Psychology of Red,' *Pop. Sci. Monthly*, Aug. and Sept., 1900.

[2] Garbini, *Arch. per l'Antrop.* (1894).

[3] *Studies from the Yale Psych. Lab.*, II, 58 (1894).

When we turn to the sexual difference in regard to colour-blindness, a subject which has been very fully investigated, there is no doubt whatever about the results. Men are much more frequently colour-blind than women. The committee on colour-blindness of the Ophthalmological Society found that among males generally (i.e., out of 14,846 individuals) the percentage of pronounced cases of colour-blindness was 3.5, the average percentage being 4.16. They found also that colour-blindness was nearly always much slighter in females than in males, and even then only existed in 0.4 per cent.[1] T. H. Bickerton finds the percentage 0.16. Therefore while colour-blindness exists in about 30 or 40 per thousand males of the general population of European countries it is found in only 1 to 4 per thousand females, being thus at least ten times more frequent in men than in women. One woman to ten men is the proportion found by Favre in France. It may be added that Edridge Green, who considers the usual tests defective, finds that 6 per cent men are definitely colour-blind and 25 per cent colour-weak (generally, i.e., trichromic, seeing red, green, and violet). He finds only 12 per cent women colour-weak.[2]

There are certain variations in the incidence of colour-blindness, among classes of the population and among races, which are of interest, and may possibly bear on the significance of colour-blindness. Among the professional classes (medical students, etc.) the Ophthalmological Society's Committee found the proportion to be 2.5 per cent; among Eton boys 2.46 per cent; among the boys and masters at Marlborough School (according to the Anthropological Committee of the British Association) it is 2.5 per cent. On the other hand, among the police and in schools of the same social rank the Ophthalmological Society's Committee found pronounced cases in the proportion of 3.7 per cent, and in middle-class schools, 3.5. In Ireland the sons of labourers are twice as liable to

[1] *Trans. Ophthal. Soc.*, 1881. [2] *Proc. Roy. Soc.*, B, 86 (1913).

colour-blindness as the boys of the wealthier classes. A comparison of urban and rural populations, so far as it shows anything, points to colour-blindness being more common in the country. Jews and Quakers are more subject to colour-blindness than the ordinary population. Among (730) females of Jewish extraction, 3.1 per cent were affected; among females belonging to the Society of Friends, 5.5; they were, however, slight cases. It was the same among the males; among 949 of Jewish extraction 4.9 were affected; among (491) Quakers, 5.9. It must be noted that the Jews were on the whole of poorer condition of life than the average, and their defects were of pronounced character; the Friends belonged to the middle class, and their defects, chiefly confined to the paler shades, were slight; the wealthy Friends were less colour-blind than the poor, though still, among males, exceeding the average.[1] Jacobs and Spielmann found no fewer than 12.7 per cent of London Jews to be colour-blind; it must be added that while in the East End the proportion was as high as 14.8 per cent, in the West End it was only 3.4 per cent; these observers associate this tendency to colour-blindness with the absence of great painters among the Jews and the bad taste in dress shown by Jewesses belonging to the lower social grades.[2]

It is necessary to take a somewhat wider survey in order to appreciate the significance of colour-blindness. Although among civilized races colour-blindness is more prevalent in the lower than in the higher social classes, among barbarous and savage races it is very infrequent. One of the earliest investigators of colour-blindness, George Wilson, examined several foreign students in England — Chinese, Kaffir, etc.: 'their appreciation of colour,' he remarks, 'is excellent, and certainly superior to that of the majority of our own students, who have not accidentally or designedly made colour a special object of study. The most

[1] *Report of the Committee on Colour-Blindness of the Ophthalmological Society.*
[2] *Jour. Anth. Inst.*, Aug., 1889.

expert of them all was the young Caffre.'[1] Later and more extended investigation has shown very clearly the freedom of lower races from colour-blindness as well as their delicacy of colour-perception. Schellong among the Papuans of the New Hebrides found that the colour-sense is highly developed; they are able without hesitation to distinguish even delicate shades of difference, although their colour vocabulary is extremely limited, and they possess only one word for green and blue.[2] Among 1200 Japanese soldiers 3.4 per cent were colour-blind. An examination of 600 Chinese men and 600 Chinese women showed that 19 men (or 3.2 per cent) and only 1 woman (or .17 per cent) were colour-blind.[3] Favre among Algerian tribes found only 2.6 per cent colour-blind. Webster Fox, in a lecture delivered before the Franklin Institute, Philadelphia, stated that in an examination of 250 Indian children, of whom 100 were boys, he did not find a single case of colour-blindness; on a previous occasion he had examined 250 Indian boys and only found 2, or less than 1 per cent, colour-blind; he finds the proportion among white boys of the United States to be at least 5 per cent. Blake and Franklin of Kansas University also examined Indians, and found that among 285 males there were only three cases of colour-blindness, or scarcely more than 1 per cent, while among 133 females none were found to be colour-blind.[4]

In Chile colour-blindness is decidedly rarer than in northern Europe. In a graduation thesis on colour-blindness at the University of Santiago, Señor Conrado Rios states that he has examined 1200 male persons, including 520 boys of from five to fifteen years of age, with the result that 3 per cent of the boys and 2.1 per cent of the men presented more or less colour-blindness. He also examined 320 females, including 143 girls of from five to fifteen years of age. One girl could not distinguish between blue and

[1] *Researches on Colour-Blindness* (1855), 77.
[2] *Zt. f. Eth.* (1891), Heft 4, p. 186.
[3] *Science*, 14 Nov., 1890. [4] *Ibid.*, 2 June, 1893.

violet, and a few confounded faint shades of green with yellow. Some other girls also showed a little hesitation in picking out certain colours, but none of the adult women presented any want of appreciation of colours at all.

Colour-blindness is clearly not a result of disease, nor is it associated with diseased conditions. It is true that it is rather more common among deaf-mutes than among the average of the population, but the deaf-mutes examined have largely belonged to the low social class in which colour-blindness has been found most prevalent. Among imbeciles colour-blindness is rare. Among criminals also it has not usually been found common. Among cretins the colour-sense is usually present, although speech, hearing, and smell are nearly always very defective. And, on the other hand, Jews, among whom colour-blindness is specially prevalent, are a healthy class of the population (except for their tendency to nervous disease), and show a very high average of ability; and the Quakers also are a distinguished class of the community.

There can be little doubt that the greater liability of males to colour-blindness is inherent and of world-wide extension. Training has little to do with it; children under ten years of age differ little from adults. The undoubted fact that women are more familiar with the names of colours has been considered a source of fallacy, but modern methods of examination do not require any acquaintance with names. The greater familiarity of women with dress has been considered to account for the difference; the colour-blindness of Quakers, who are usually considered as indifferent to dress and favouring sombre hues, might be brought forward to support this theory. But it can scarcely be used to explain the very marked sexual difference among lower races; and it may be quite as reasonably argued that the Society of Friends found a specially large number of recruits among individuals indifferent to colour and defective in perceiving it.

It is doubtless significant that such scanty evidence as I

have been able to gather concerning keenness of colour-perception does not seem to agree with the very clear evidence concerning colour-blindness. It is noteworthy that in Nichols's experiments — though these were not on a decisive number of persons — the colours in regard to which the men were especially more sensitive than the women were red and green, precisely the colours that are defectively seen in colour-blindness. And Green found that exceptional range of colour-perception occurred exclusively in males. It would seem that we are dealing with two different classes of phenomena. Colour-blindness is a defect comparable to albinism and to the other congenital abnormalities that are more common in males. It has nothing to do with keenness in sensory discrimination, and it is probable that, as seems to be true in regard to some other sense perceptions, there is greater range and acuteness of colour-perception in men. Colour-blindness may be regarded as a typical example of a variation, such as we shall have to deal with in a later chapter.

COLOURED HEARING

This is one of the names for the best-known of a large group of slightly abnormal psychic phenomena. A person is the subject of coloured hearing when a particular sound immediately and involuntarily brings a particular colour to the mental eye. Usually each of the vowel sounds has a colour of its own, and words are coloured accordingly. Besides coloured hearing we may have other automatic sense-associations, such as coloured gustation, coloured olfaction, coloured tactility, coloured motility.

Sir Francis Galton many years ago investigated various of these associations. He seems to have found colour association more common in women than in men; he also found that it 'appears to be rather common, though in an ill-developed degree, among children.' [1] The allied phenomenon of the 'number-form' ('the sudden and auto-

[1] *Inquiries into Human Faculty*, 147.

matic appearance of a vivid and invariable form in the mental field of view, whenever a numeral is thought of, and in which each numeral has its own definite place') was also found by Galton to be more common in women; speaking roughly, it exists in 1 out of 30 males, and in 1 out of 15 females. Number-forms originate at an early age, and are commoner in young persons than in adults.[1] Fechner collected 73 cases of coloured hearing, 35 of men, 38 of women; they were nearly all adults and of the educated classes. Krohn found that coloured hearing and similar phenomena are more common in women than in men. An investigation at Wellesley College of 543 persons, showed that nearly 6 per cent possessed the faculty of coloured hearing, while about 18 per cent showed either coloured hearing or number-forms, or both combined. This is certainly a high proportion, although I do not know of any similar investigation at a men's college with which to compare it. The results were verified and confirmed by questioning the subjects after an interval of two months. Large, however, as this percentage is, it is greatly exceeded by the results of a subsequent investigation at the same college on the students who entered in the autumn of 1892; out of 203 persons not less than 15.7 per cent were colour-hearers, while 30.2 per cent had 'forms,' and 8.4 per cent showed both psychic abnormalities.[2] Helen Thompson investigated the comparative frequency of colour-hearing

[1] *Inquiries into Human Faculty*, 119. Galton remarks that the somewhat allied power of visualising — or of unconsciously storing up in the mind mental pictures which may be voluntarily recalled — 'is higher in the female sex than in the male, and is somewhat, but not much higher in public schoolboys than in men. . . . There is reason to believe that it is very high in some young children, who seem to spend years of difficulty in distinguishing between the subjective and objective world. Language and book-learning certainly tend to dull it' (p. 99). The men of science he spoke to knew nothing of it. 'On the other hand . . . many men, and a yet larger number of women, and many boys and girls, declared that they habitually saw mental imagery, and that it was perfectly distinct to them, and full of colour.' Cross-examination brought out the truth of these assertions (p. 85).

[2] Mary W. Calkins, 'A Statistical Study of Pseudo-Chromesthesia and of Mental Forms,' *Am. Jour. Psych.*, July, 1893. This is an interesting and detailed study.

in men and women and found that only 5 men experienced it to 13 women; in the men, also, it was much more weakly developed than in the women.

It may be asserted with little fear of contradiction that all investigators who have given attention to the point have found coloured hearing and allied phenomena more common in women than in men, and probably more common in the young than at a later age.

If we sum up the results as regards the various senses we find that women are superior to men in general tactile sensibility, and perhaps superior in sense of smell and of taste; as regards the other senses the evidence is less conclusive, but it would not seem that men are clearly and decidedly superior to women. As Thorndike remarks, 'the most important characteristic of these differences is their small amount.' In so far as the balance of advantage is on the side of women, it is less emphatically on their side than popular notions would have led us to expect. There can be little doubt that the popular belief, even when it happens to be in the main correct, is really founded on the confusion of two totally distinct nervous qualities — sensibility and irritability, or, as it is perhaps better called, affectibility. The first means precision and intensity of perception of stimulus; the second is the readiness of motor response to stimulus. These two nervous qualities may, and usually do, vary independently.[1] The clear distinction between sensibility and irritability in the present connection has been clearly stated by Sergi, and by Lombroso and Ferrero, but the keen intuition of Coleridge had long before noticed that an important sexual difference is the greater 'irritability' of women, the deeper 'sensibility' of men. It was also perceived some years ago by Galton, who was the

[1] The greater affectibility or 'irritability' of women may be perceived at a very early stage of primitive culture and confused with greater sensibility. An interesting example is furnished by Sir E. im Thurn, who tells us that women sometimes take part in the very vigorous whipping game of the Arawacks of Guiana; on such occasions a wooden figure of a bird is substituted for the whips, and a gentle peck given in place of the more serious lash. (*Jour. Anth. Inst.*, Feb., 1893, p. 198.)

first to make accurate investigations of sexual sensory differences. 'At first,' he remarks, 'owing to my confusing the quality (sensitivity) of which I am speaking with that of nervous irritability, I fancied that women of delicate nerves who are distressed by noise, sunshine, etc., would have acute powers of discrimination. But this I found not to be the case. In morbidly sensitive persons both pain and sensation are induced by lower stimuli than in the healthy, but the number of just perceptible grades of sensation between them is not necessarily different. I found as a rule that men have more delicate powers of discrimination than women, and the business experience of life seems to confirm this.' [1] When we come to consider the affectibility of women this important distinction will become still clearer.

[1] F. Galton, *Human Faculty*, 29.

CHAPTER X

MOTION

Muscular strength — Women's joints smaller — Ricardi's experiments showing maximum energy more quickly reached by women — Reaction-time — Rate of movement slower in women — Bryan's experiments on rate of motion — Rarity of women acrobats — Women and physical training — Sexual differences in voluntary motor ability — Women telegraph clerks — Handwriting — Women's slighter muscular energy probably an organic character — Manual dexterity — Opinions of teachers — The general opinion that women have less manual dexterity than men — Dexterity of women in various trades — Sense-judgments — Business experience — Various experiments — Women probably as well able to form accurate sense-judgments as men.

WHATEVER doubt there may be about sexual differences in the sensory appeal there is little doubt as to the sexual differences in motor response, at all events in its coarser outlines. Except among certain lower races, and then almost exclusively in that more passive form of muscular activity involved in carrying burdens, women everywhere reveal a somewhat less capacity for motor energy than men, and a less degree of delight in its display. According to Theile, the muscular system of a powerful adult woman is less than a third of the total weight, in man rather more than a third. Among civilised races the difference is great and obvious to all. There is no form of vigorous muscular action, with the sole exception of dancing, for which civilised women show greater attraction and aptitude than men.

It may be necessary to point out that the lack of capacity and inclination among women for violent muscular effort, and for long prolonged muscular effort at a high tension, must not lead us to conclude that under natural conditions, and within their own proper limits, women are less active than men. It is even possible to maintain that they are more active than men. As we saw at the outset, in primitive societies the spasmodic violent activities

of men in war and the chase are often interrupted by long periods of rests, while the work of women is continuous. Fouillée (in his 'Tempérament et Caractère') attempted to build up a whole psychology of the sexes mainly deduced from the difference between the active male sperm-cell and the passive female egg-cell. Man's general activities are the embodiment of the first, and woman's of the second. But, as Heymans rightly remarked (in his 'Psychologie der Frauen'), this notion can only appear plausible so long as we forget that a woman, just as much as a man, is the product of both these cells. Heymans refers to the impulse of women always to do a thing at once, to their tendency to occupy themselves even in moments of leisure, when men often seek complete passivity. He finds that such exact data as he could collect lead to the conclusion that, far from being less active, women are decidedly more active than men.

Even at that period in the evolution of puberty when girls are in most respects ahead of boys, they still remain, as Pagliani and others have shown, both in vital capacity and muscular power, much behind boys. Roughly speaking, the force of the female hand, measured by the dynamometer, is one-third less than that of the male hand; boys can carry about one-third more than girls; and while a man can carry about double his own weight a woman can carry only about half hers. While the average male golf player (according to Whitney) can lift the ball from 120 to 140 yards, the average female player lifts it only from 70 to 100 yards. At the Bath meeting of the British Association the mean strength of squeeze was 35–40 kilos in men, 20–25 in women. The Anthropometric Committee of the British Association found that women (chiefly shop assistants and pupils in training institutions for schoolmistresses) are little more than half as strong as men. Manouvrier in France, comparing weight of femur with dynamometric pressure, found that muscular force is to bodyweight as 87.1 to 100 in men and only as 54.5 to 100 in

women. Sargent in America found that in strength of expiratory muscles the weakest boys are stronger than the average girl, and although in strength of back, legs, chest, and arms, the girls are slightly better, still 50 per cent girls fail to reach a point of strength surpassed by 90 per cent boys. Galton in England found in his laboratory that of some 1600 women of various ages the strongest could only exert a squeeze of 86 lbs., or about that of a medium man. 'If we wished to select the 100 strongest individuals,' he remarks, 'out of two groups, one consisting of 100 males chosen at random and the other of 100 females, we should take the 100 males and draft out the 7 weakest of them, and draft in the 7 strongest females.' [1] In New York, F. S. Lee, investigating the strength of various groups of munition workers by a spring balance test, found that the average industrial woman had less than half the physical strength of the average industrial man; the women employed on their heaviest job averaged only two-thirds of the strength of the men employed on their lightest job. This seems to illustrate the statement often made that women do not show well in work organised to suit men. A significant character of sexual difference in motor activity appears to be indicated by the fact that not only are the muscles smaller and muscular energy less in women, but the joints are also decidedly smaller. Dwight states that 'small size of joints is characteristic of women.' He has found that there are notable sexual differences in the extent of the articular surfaces of the long bones. He measured the head of the femur and of the humerus in one hundred males and one hundred females, all adults, and with the cartilages still in a fresh condition. The heads of the bone were nearly always relatively larger in men; the difference was very constant as regards the humerus. Hepburn found that the same holds true among savages. G. A. Dorsey found the

[1] *Jour. Anth. Inst.*, 1885. The pull, grip, and crush of various groups of English and Scottish women are given by Cathcart, *Physique of Women in Industry* (Industrial Fatigue Research Board, no. 44, London, 1927), and are mostly rather higher than the earlier figures recorded above.

same difference among skeletons from the mounds of Ohio, Northwest Coast Indians, and Peruvians.

Manouvrier regarded women's muscular inferiority as fundamental. 'I regard this female inferiority,' he remarks,[1] 'as the true counterpart of a superiority: the exclusive aptitude to produce children. It is certainly not altogether an enviable superiority,' he adds, 'and it has always seemed to me that when I have reminded feminist audiences of this superiority, my statement has been somewhat coldly received, almost as something which was not on the *agenda* paper.' The female animal, as Manouvrier views the matter, is necessarily incapable of providing properly for herself and her young during gestation and infancy; therefore it becomes necessary in the interests of her and her offspring, that the male should be provided with powerful teeth and specially strong muscles to procure food for the whole family.

To prove this view of the muscular superiority of the male as a radical sexual difference, a real secondary sexual character, it would be necessary to show that it is well marked in animals. This scarcely seems yet to have been done. In the lower races, also, the muscular superiority of men seems less marked than in civilisation. Thus the exact investigations of Bobbitt in the Philippines showed that while in Chicago boys are at all ages stronger than girls, in the Philippines boys and girls are equal in strength till thirteen, when girls are perhaps stronger; it is not until the age of fourteen that boys begin to gain muscular superiority. The fact, however, that even under natural conditions women are unable to maintain their early muscular superiority seems favourable rather than unfavourable to Manouvrier's view.

On the whole it may be said, roughly, that the muscular strength of a man is about equal to one-half as much again as that of a woman. It is interesting to observe that this relation of the muscular strength of the two sexes seems to

[1] *Revue de l'École d'Anth.*, Feb., 1909.

have been accurately observed even centuries ago, and to have furnished a basis for establishing the wages of women as day-labourers. Thus I note that in 1682 in Suffolk, the wages of a man hay-making, with meat and drink, were fivepence per day, of a woman threepence; the wages of a man reaper were tenpence per day, of a woman sixpence.[1] In Essex, during the same century, Thorold Rogers states in his 'Six Centuries of Work and Wages,' the magistrates fixed one shilling and tenpence as the wages of men reapers, one shilling and twopence for women; on piece work men and women generally received the same price, so that there was no attempt to underpay women as women. Almost exactly the same sexual ratio of payment for muscular labour seems to be maintained still. Thus in Germany in 1897,[2] the mean ratio of wages for adult male labour was two shillings and fivepence a day, and for adult female labour one shilling and sixpence. In London the Chairman of the South Metropolitan Gas Company stated in 1916 that the amount of work a woman turned out was about two-thirds of that of a man, and therefore women were paid two-thirds the rate paid to men. Similarly in Germany, where many women during the Great War were employed on the railways, it was found that in purely manual labour the capacity of the women was from 50 to 75 per cent that of the men. (This seems to correspond, though we must here allow for possible fallacies, with the differences in the amount of food ingested; thus a London vegetarian restaurant keeper stated some years ago that the average price paid by a man for a vegetarian dinner was tenpence, by a woman sixpence.) Similarly in Japan a woman can do three-fourths to four-fifths of a man's work and her wages are about three-fourths of his.[3]

It thus comes about that, as Sidney and Beatrice Webb state, 'inferiority of earnings is almost always co-existent

[1] *Victoria History of Suffolk*, I, 660.
[2] *Labour Gazette*, March, 1898.
[3] *Japan Advertiser*, 23 July, 1920.

with inferiority of work,' [1] or, as we may better put it from the present point of view, the amount of wages is almost exactly proportioned to the amount of energy the organism is able to put forth. It would appear that, as regards the two sexes, this has for centuries been almost as exactly adjusted as though it had been scientifically measured.

When women are able to put forth the same amount of work as men (as Mr. and Mrs. Webb remark in the work just quoted) they usually receive the same rate of payment. This is so among the Lancashire cotton weavers, the cleverer women here often getting through more work, and earning more wages, than the men.

It must be remembered that we are here dealing with work that is preponderantly muscular. When we are concerned with work that is chiefly mental we frequently find that exactly the same amount is demanded from women as from men, and under such conditions women are entitled to demand exactly the same payment.

In recent years various investigations have been carried out which show how the muscular output of women varies widely in different classes of the community, and among different groups of workers, and it is considerably affected, not merely by practice and personal predisposition but by the different methods in which it is carried out. Thus among college women at Leland Stanford University Drs. Clelia Mosher and Ernest Martin, using a spring balance to test various muscles, and dividing the subjects into groups according to their general muscular development (found by dividing the total strength, determined by the tests, by the weight), reached various interesting results. The group with the greatest general strength factor approached in strength a control group of athletic college men, but were almost uniformly made up of women of completely feminine type. The pectoral muscles were relatively stronger in the men, but numerous women equalled or exceeded the men in this respect. The

[1] *Problems of Modern Industry* (1902), 75.

latissimus dorsi is, relatively, better developed in women than in men, and in this connection is mentioned the frequent buttoning of women's garments at the back, calling this muscle into use. The greater development of the deltoids in the women is attributed to their frequent use in dressing the hair, a severe exercise when women wore heavy hair. Forearm extensions and flexions were better developed in men; wrist extensions (employed in sewing, piano-playing, etc.) relatively greater in women; dorsal flexion greater in women and attributed to dancing; and adduction of the thighs also greater, and attributed to the conventional demand on women to keep their knees together. These investigators believe that 'there is no difference in the muscular strength of women and men which is due to sex as such.' [1]

In England an important scientific investigation into the physique of women in industry has been carried out by E. P. Cathcart, with several medical collaborators, for the Industrial Fatigue Research Board. Confirming several previous investigations, both in Britain and America, Cathcart found that the physical condition of groups of educated women is superior to that of their sisters engaged in industry; they are taller, heavier, and stronger. This was so to a marked extent in a Glasgow Teachers' Training College, where the girls did not come from affluent families but underwent medical examination on entrance, were under good conditions, their physical state attended to, and submitted to training as well as playing games; equally or more important, in the opinion of Cathcart (accepting a suggestion of Martin's), is the general mental alertness and increased power of coördinating the muscles. Cathcart's factory women belonged to Glasgow and he is careful to point out that (as Gray and Tocher have shown) the Glasgow population is not typically Scotch, but it may be typically industrial. In mean height, mean weight, mean pull, mean grip, and mean crush the college women

[1] *Jour. Am. Med. Assoc.*, 19 Jan., 1918.

excelled the factory women. Moreover, when each class was divided into country-bred and town-bred, the country-bred college women excelled the country-bred factory women at every point, and the town-bred college women equally excelled the town-bred factory women. There were, however, a few anomalies between college and factory women; thus the crush of the country-bred college women exceeded that of the town-bred, while, on the other hand, the town-bred factory women had a better crush than the country-bred. Cathcart considers that the evidence supports the popular belief that the rural population is of better physique than the urban. At the same time he regards the girls employed in the chemical works at Glasgow — all over the age of 16, born and bred in the slums, and following for the most part the same occupation as their mothers and grandmothers — as perfect specimens of young womanhood in physique and grace of carriage. They are in exceptional cases able to move from 20 to 25 tons of raw material a day, lifting the shovel to a height of 30 inches. In the tin plate industry which, so far as the inquiry went, is the heaviest for young female workers, the average weight lifted in the day by both male and female workers is 3½ tons and the average percentage relation of a single load to body-weight is 58 per cent for the female workers and 52 per cent for male workers. The workers themselves select the size of the loads they raise. The relation of the load to body-weight was higher in the females, alike of younger (14–16 years) and older (16–18 years) of age. The females were of better build and physique than the males, who seemed sometimes to show signs of distress. They tended to work spasmodically, taking a heavy load and then resting, while the females worked more steadily. In all industries where the worker can select the load to suit personal convenience, Cathcart found, the work done is greater than where the worker cannot exercise his or her volition in selecting the load. Cathcart finds that for regular work a load of 40

per cent of body-weight should be a maximum for female workers, and for occasional weights 50 per cent of body-weight.[1]

It will be seen that conditions of work generally affect the output, and where the output of work by women is very inferior it is generally found that the conditions have been unsatisfactory. Conditions of factory work involving much monotony, long standing or long sitting, or the continuous use of one set of muscles, are well recognised as unfavourable for women.[2] Similarly it was found among English munition workers during the war that women suffer more than men from long hours. Dr. H. M. Vernon, who analysed over 50,000 accidents in four large munition factories, stated in a report to the Health of Munition Workers Committee in 1918 that in one factory a twelve-hour day raised the accidents among women to 2½ times more than in a ten-hour day, while accidents among the men showed little difference. The women also were treated for faintness twenty-three times more frequently, and the men only three times more frequently, than in the shorter day. Coldness, again, numbing the fingers and diminishing manual dexterity, had a slightly worse effect on the women than on the men.

An interesting sexual difference in muscular force was clearly brought out by Riccardi; experimenting with the dynamometer on over 350 men and women, he found that while, with the right hand, 36 per cent only of the men exhibited their maximum force at the first attempt, 38 per cent at the second attempt, and 18.8 per cent at the third, 57.8 per cent of the women gave a maximum result at the first attempt, 20.4 at the second, only 9.9 at the third. For the left hand the results were: for the men, 49.8 at the first attempt, 24.8 at the second, 21.9 at the third, and for the women, 49 per cent at the first attempt, 36.2 at the second,

[1] 'The Physique of Women in Industry,' Industrial Research Board, 1927; *Brit. Med. Jour.*, 5 Feb., 1927, p. 250.

[2] See, e.g., R. M. Keir, 'Women in Industry,' *Pop. Sci. Monthly*, Oct., 1913.

and 9.9 at the third. This result, showing that weaker women reach their maximum quicker than men, and that the weaker left hand of men resembles women in this respect, indicates a connection between weakness and promptness of reaction, and perhaps has some bearing on the general character of motor action in women.[1]

Riccardi's observations with the dynamometer may be said to be confirmed by Wells's observations with the tapping test on twenty adults (ten men and ten women). In the first experiment with the right hand the women were able to tap more rapidly than the men, but after that they were inferior to the men, and progressively inferior, while the men slightly improved. The men were throughout superior in tapping with the left hand, and their superiority increased greatly as the experiment progressed.[2]

Herzen long ago made a series of experiments at Florence into the influence of age and sex in modifying reaction-time — that is to say, the time taken in reacting to a signal. He was impressed by the slowness with which children co-ordinate or associate two movements, as of the hand and foot. His figures show that girls react at first more quickly than boys, but while in the latter the reaction accelerates regularly up to adolescence, in the former it accelerates less rapidly, and stops short at a lower rapidity than that of the masculine sex.[3]

Various investigations have been made in more recent times with regard to reaction-time. Thus Gilbert, in a careful series of experiments on over 1000 children in the schools of New Haven, Connecticut, found that children grow steadily quicker in simple reaction-time as they grow older, and that boys are rather quicker than girls at all the ages investigated (6 to 17); the bright children were quicker than the dull children, though at some ages this difference was not found. When discrimination and choice

[1] P. Riccardi, *Arch. per l'Antrop.*, Fasc. 3 (1889).
[2] F. L. Wells, *Am. Jour. Psych.*, July, 1909.
[3] A. Herzen, *Le Cerveau et l'activité cérébrale*, 96–98.

were involved in addition to simple reaction, the sexual difference was diminished, and the girls were almost as quick as the boys.[1] Albert L. Lewis, who made a large number of experiments on reaction-time (for light, sound, and electric shock) in different classes of persons, found that the order of decreasing rapidity was American men, Indians (these two groups being equal), Negroes, American women; the Negroes, however, came last in response to light.[2]

Reaction is quicker (according to Buccola) among the educated than among the uneducated, but the investigation of some Italian men of genius has shown that in them reaction-time is slow,[3] and Wissler found that reaction-time is a very poor measure of mental efficiency.[4] It is also very slow in the insane, and extremely slow in idiots. Some Japanese jugglers examined by Herzen reacted very slowly. The north Italians, he found, reacted more quickly than the south Italians, and a Norwegian reacted most quickly of all.

Several series of investigations have been carried on concerning sexual differences in the rate of voluntary movements. Cattell and Fullerton found that this rate, which is very constant, is decidedly slower in women than in men.[5] Jastrow found, among the students of Wisconsin University, that normal movements, when no special direction is given, are quicker in women, but that the maximum movements, particularly in the case of longer movements, are quicker in men.[6] Helen Thompson found that in all tests of motor ability the men were superior to the women, having shorter reaction-times with smaller mean variation, greater rapidity of movement, and somewhat greater accuracy, and they were less easily fatigued than the women. But the

[1] J. Allen Gilbert, *Studies from the Yale Psychological Laboratory*, II (1894), 77.
[2] *Psych. Rev.*, March, 1897.
[3] *Archivio di Psichiatria* (1892), 394, 395.
[4] *Psych. Rev. Monographs*, III, 1901.
[5] *On the Perception of Small Differences* (Philadelphia, 1890), 114.
[6] *Am. Jour. Psych.*, April, 1892, p. 425.

women excelled the men in making new motor combinations. Bryan made an elaborate study of rate of movement on about 800 school children (the sexes being nearly equally divided) belonging to Worcester, Massachusetts. A fairly simple instrument was devised to receive tapping movements on the button of a Morse key and to record them on a clock face; the amount of force required was insignificant, and the tapping movements could be executed by the arm, forearm, or finger, so as to give the rate for the various joints. The differences between boys and girls were not found to be considerable, but there was a slight superiority of boys over girls on the whole. It must be noted, however, that the best single record was made by a girl of twelve, who 'looked the type of robust health,' and when asked if she played the piano, replied, 'Only by ear; but I play baseball though,' adding, 'I can strike two over an octave on the piano.' A girl of thirteen, who had taken lessons on the violin for two years, showed the influence of special practice by the high rates of the joints involved in playing the violin and the low rates of others not thus exercised. The superiority of the boys over the girls increases slightly from the age of 6 to that of 9, and more decidedly from 14 to 16. They are nearest together between 10 and 12. At 13 the girls are superior to the boys for each of the eight joints tested. The period from 12 to 13 is one of retardation of rate in boys and acceleration in girls. Boys are more superior to girls as regards the right side than as regards the left, so that the two sides are more alike in girls than in boys. The acceleration of rate in girls between 12 and 13 is followed by a retardation between 13 and 14; while in boys between 13 and 14 there is an acceleration followed by a decline between 14 and 15. It is significant that the decline and antecedent accelerations are more extreme in girls, and that the recovery is slower; so that girls of 13 almost reach, and sometimes surpass, girls of 16, and girls of 13 also surpass in every joint boys of 13, and in the case of four joints are faster

than boys of 14. Comparison of the increments of rate in boys from 15 to 16 with those in girls from 14 to 15 shows the former to be decidedly greater in the case of every joint, and in the case of seven of the eight joints the increment of rate in boys from 15 to 16 is greater than in girls from 14 to 16. Some additional experiments with reference to precision of movement also showed a slight superiority of boys. In summing up his general results, Bryan remarks: 'It would seem something more than a reasonable surmise that the general acceleration of the rate in girls from 12 to 13, and in boys from 13 to 14, is an expression of high tension in the nerve-centres in many individuals at those ages; that the decline following is an expression of nervous fatigue consequent upon the functional changes at those periods; and that the re-acceleration is a sign of recovery from that fatigue. It is significant that the antecedent acceleration and the decline are more extreme in girls than in boys, and that the girls recover more slowly. It seems not unlikely that these facts may prove of hygienic significance.' [1] It is interesting to compare these results with what we know as to the rate of growth in boys and girls about the period of puberty, and the accelerations and retardations in that growth; it is probable that there is a real connection.

Delaunay [2] argued with much ingenuity that motor evolution is from the centripetal to the centrifugal; that centripetal movements of abduction and of pronation predominate among species and individuals little advanced in evolution, and among these he includes quadrupeds, apes, the lower human races, women, children, and unintelligent persons; while centrifugal movements of abduction and supination predominate among the higher human races, in men and in intelligent persons. Corkscrews, etc., are worked from left to right; so are watches, though

[1] W. L. Bryan. *Am. Jour. Psych.*, Nov., 1892.

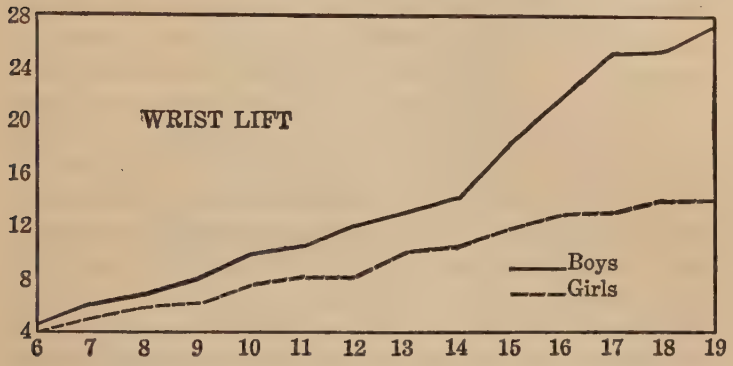
[2] 'Les Mouvements centripétes et centrifuges,' *Revue Scientifique*, 25 Dec. 1880.

formerly from right to left; and writing, which was formerly, and still often is among children, from right to left, is now from left to right. (It appears to be a fact in harmony with Delaunay's argument that mirror-writing, from right to left, is found more frequently in girls than in boys.) 'Women,' he remarks, 'preferably execute centripetal movements. Thus they give taps or slaps with the palm of the hand, men with the back. According to my observation, men make circumferential movements like the hands of a watch, women in the opposite direction. Again, all women's garments, from chemise to mantle, button from right to left, while men's garments button from left to right. When a woman puts on a man's coat, she buttons it with the left hand, with a centripetal movement.' It may be added that, apart from evolutionary progress, the characteristically masculine attitude of aggression is centrifugal, the characteristically feminine attitude of defence centripetal; compare, for instance, the poses of the Apollo Belvedere and the Venus de Medici.

Thus, alike in strength and in rapidity and precision of movement, women seem inferior to men. This is a conclusion in harmony with the practical experience of life. It is perhaps also in harmony with the results of those investigators who have found that, as in the blood of women, so also in their muscles there is more water than in those of men.[1] To a large extent it is certainly a matter of differences in exercise and environment. It is perhaps, also, partly a matter of organic constitution. That this latter factor can in any case account for more than a small proportion of the muscular difference which exists between civilised men and women is impossible, when we consider the muscular strength displayed by the women among some savage races. But it is suggested by the parallelism between rate of movement and rate of growth. Gilbert, among Iowa school children, found indeed that the strength of girls, as measured by wrist-lift, was fairly

[1] *Arch. per l'Antrop.*, VI, 173.

regular in its increase, but there was a marked sexual dividing point at the age of fourteen, boys then beginning their most rapid increase, while the rate of development of the girls was slightly but permanently retarded, so that at the age of nineteen a boy is able to lift just about



twice as much as a girl (see Diagram). It is a significant fact that on the music-hall stage feats of strength are, comparatively, rarely performed by women, and the proficiency they reach is less.[1] It must be remembered that acrobats are frequently the children of acrobats, and receive the most skilled and careful training from the earliest age, and that girls probably have as good a chance of becoming successful acrobats as men. The general tendency of men to violent muscular action, and the greater tendency of women to repose and the storing up of force, has been expressed by saying that men are katabolic, women anabolic. The motor superiority of men, and to some extent of males generally, may thus be related to their whole psychic organisation. It was not an accident that at Pompeii and Herculaneum, while the men were found in a state indicating violent muscular efforts of resist-

[1] For athletic records of men and women in tabular and pictorial form, see *Strand Magazine*, April, 1911. In the case of the high vault the man is exactly twice as good as the woman, and almost twice as good in driving the baseball. On the average, however, man's superiority is less than this; he is, roughly speaking, about half as good again.

ance, the women were in a condition of resigned despair, or clasping their children.

It must, of course, always be remembered, and it is not nowadays likely to be forgotten, that any conclusions regarding sexual differences in muscular force and energy have to be qualified by the fact that some women can perform the feats of strength and endurance which are within the power of a larger number of men. This is well illustrated by the achievements of those swimmers who have succeeded in crossing the English Channel. Up to September, 1928, this feat had been achieved by fifteen persons, of whom five were women. It may be noted that, as regards time taken, the women came near the average, none of them being among either the quickest or the slowest swimmers.

The success which women may achieve in tennis is now also well recognised. W. T. Tilden, however, in a critical comparison of the sexes as tennis-players, and admitting that women 'are just as great artists' as men in tennis, which has developed in them a splendid sportsmanship, finds that 'the physical limitations of height, weight, speed of foot, and bodily structure, prohibit women ever attaining a skill equal to men's in tennis.'[1]

If we proceed to inquire into the relative sexual differences of muscular strength in the various parts of the body, we may find precise information in a study by Kellogg of 200 men and 200 women, made with a specially devised dynamometer. He shows that the muscles of the chest are notably weak in women, agreeing with the weak inspiratory power of women; the muscles of the back are also very weak in women (whence probably the frequency with which they complain of back-ache); weakest of all are the flexors of the arm and the pronators and supinators of the forearm. It is in the legs, and especially in the thighs, that women are relatively strongest; the abductors and adductors of the thigh are the strongest muscles of the

[1] W. T. Tilden, 'Women in Tennis,' *Plain Talk*, Oct., 1928.

average woman. This is in accordance with the fact that thigh circumference is the only large external proportion of body in which women surpass men absolutely as well as relatively, and indicates that the larger thighs of women are not due merely to greater amount of adipose tissue.[1]

The marked weakness of the muscles of the back in women, due to defective body movements, is not only, as Kellogg notes, connected with the frequent tendency to back-ache; we must certainly associate it also with a much more serious condition. It is well known that lateral curvature of the spine (or scoliosis) is much more frequent in females than in males. Thus Bradford and Lovett, among 2300 cases, found that there were 84.5 per cent females to only 15.5 males, and Bernard Roth,[2] among 1000 cases, found a still higher proportion of females. The majority of these cases occur between the ages of ten and fifteen, and there can be no doubt that defective muscular development of the back occurring at the age of maximum development — and due to the conventional restraints on exercises involving the body, and also to the use of stays which hamper the freedom of such movements — is here a factor of great importance.[3]

In the introductory chapter I have referred to the evidence which shows that among the lower races in many parts of the world, the women appear to be often nearly or quite as strong as the men, if not indeed stronger. It may be proper at the present stage to point out that while such facts are undoubtedly reliable, and it would be easy to multiply them, they require some analysis before we

[1] J. H. Kellogg, 'The Value of Strength Tests,' a paper read to Am. Assoc. Advancement Phys. Education, 1895.

[2] *Brit. Med. Jour.*, 9 Oct., 1897. Also Paul Roth's analysis of his father's cases in the same journal, 2 Sept., 1911.

[3] Among Roth's cases, both boys and girls, in only fifty-four were the clothes not too tight when patient was placed in the best possible position. In the large majority of the other 946 the clothes across the chest were three inches or more too tight. Murk Jansen of Leyden (*Brit. Med. Jour.*, 16 Nov., 1912) emphasises the desirability of allowing young children to lie much on their bellies, thus encouraging them to creep and crawl, and to lift the head, so strengthening the muscles of the back.

properly understand their significance. I am in complete accord with the comments on this point of Professor Waldeyer, who remarked that the apparently greater strength of the women among, for instance, many Negro races is simply due to the division of labour by which the women act always as porters. As Waldeyer observed, a man will tire of carrying a baby before a nursemaid will. It is thus that we must explain the ability of the wives of Negro soldiers (in whom the left foot had been cut off according to Abyssinian custom), after the battle of Adowa, to carry away their husbands, often finely developed men, on their backs, a distance of several miles.

The muscular development and strength of the women among many savage races is thus doubtless the result of special cultivation, and mostly confined to the bearing of burdens. It is not, however, without significance, since it shows the physical advantages derived from a cultivation of the muscles much greater than is common among civilised women. These advantages are, however, obtainable in Europe as, indeed, is sufficiently indicated by the English pit-brow women of Lancashire collieries. 'Their work' (I quote from a newspaper account written by a lady) 'consists of stacking coal and pushing hand waggons from the shaft to a stock heap. Others stand below a large sieve which is worked by machinery, and pick stones and rubbish from the coal as it is carried on an endless iron belt from the apparatus and dropped into the railway truck beneath. Some are employed in keeping the shoot clear down which coal passes as it is shot into a canal boat. A doctor, who works in a mining village in Lancashire, considers "the pit-brow girls much more healthy and hardy than mill girls." Another gentleman, also a dweller among them, remarked on the fine physique of the women and the splendid children they produce.' An American observer writes of the pit-brow girls of the Wigan district: 'You cannot find plumper figures, prettier forms, more shapely necks, or daintier feet, despite the ugly clogs, in

all of dreamful Andalusia. . . . In the village street or at church on Sunday, you could not pick her out from her companions, unless for her fine colour, form, and a positively classic pose and grace of carriage possessed by no other working women of England.' It is to be regretted that the jealousies of male workers, aided by prejudices concerning the 'unwomanly' nature of muscular development, are in England driving women out of healthy outdoor employment into unhealthy indoor employments. A distinguished American gynæcologist, G. J. Engelmann, found improvement in the functional health of women running parallel with greater attention to sports and physical training. 'Physical training begun in early life,' he remarks, 'the habit of exercise, will do much to remove the susceptibility to injury during the physiological fluctuations of the functional wave, as we are taught by the acrobat, who, under constant training from childhood on, persists in her trying feats, requiring the greatest nerve and muscle strain, and the highest coördination of all powers, unaffected by the menstrual period.' [1]

Another picture may be brought forward of the muscular energy of women when working under favourable conditions. Mr. H. J. Hine, of Oxford University, writes: 'Last autumn I was helping to uncover a buried city on the site of the Beth-Shan of the Old Testament, a mile west of the River Jordan. Fifty of our native workpeople were women. These Arab women lived on green figs, grapes, onions, and a sticky kind of bread. Evidently the diet is suited to the climate, for, in spite of the oppressive atmosphere in that valley 400 ft. below the level of the Mediterranean Sea, the women were amazingly strong and many of them were of great beauty. Our strongest woman, by name Handooma, one day carried a boulder so heavy that it took five men to lift it on her head. Even this did not engage all her energy, and, as she picked her path and

[1] G. J. Engelmann, 'The American Girl of To-day,' *Trans. Am. Gynecol. Soc.*, 1900.

struggled under the burden, she shouted to the five men exactly what she thought of them for the clumsy way they had loaded the stone on her head. Less spectacular but more graceful were the girls who carried baskets of excavated earth away to the *débris* dump at the edge of the site. Singing a happy song they would swing the baskets lightly up onto their heads, then walk along in slow, unhurried procession like an animated frieze. One girl was a veritable Cleopatra, and I often used to laugh to think how our Hunt ball at home would hold its breath if Masheih were to step majestically into the room. Every evening babies were brought to the site to meet their mothers at close of work. Faces lit up and joyous greetings were waved.' [1]

While it is highly desirable that women should pay attention to their muscular development and their physical training, it is not desirable that this should be done with the ambition of competing with men. To women the involuntary muscular system is of special importance, more especially in its bearing on the maternal functions, and it does not appear that development of the voluntary muscles has any necessary beneficial effect on the involuntary muscles. I have noticed that well-developed muscular and athletic women sometimes show a marked degree of uterine, as well as vesical, inertia in childbirth, while on the other hand the processes of parturition are often carried out in the most admirably efficient manner in fragile women who show a minimum development of the external muscles. So far as I have made any inquiries, this observation is in harmony with the opinion of experienced observers. Thus Dr. Engelmann, who, as we have seen, insisted on the importance of physical training for women, yet wrote (in a private letter): 'In regard to this interesting and suggestive question, it does seem a fact that women who exercise all their muscles persistently meet with increased difficulties in parturition. It would certainly seem

[1] *The Times*, London, 7 Aug., 1928.

that excessive development of the muscular system is unfavourable to maternity. I hear from instructors in physical training, both in the United States and in England, of excessively tedious and painful confinements among their fellows — two or three cases in each instance only, but this within the knowledge of a single individual among his friends. I have also several such reports from the circus, perhaps exceptions. I look upon this as a not impossible result of muscular exertion in women, the development of muscle, muscular attachments, and bony frame leading to approximation to the male.' It is true that peasants and labouring women are not specially liable to suffer in this way, but in such cases the muscular development is generally gradual and diffused, and probably less likely to lead to any disturbance in the nervous balance of the body.

The physical development of women should not, therefore, proceed along the same lines as that of men, and Lagrange, Mosso, and others are on sound ground when they argue that it should not be athletic in its methods. The points of greatest weakness in modern women are, as we have seen, the respiratory muscles of the chest with those of the arms, and the muscles of the back with the complementary muscles of the abdomen. Such movements as are involved in some of the slower Spanish dances are admirably adapted to correct these defects, and, as Marro insists, swimming is even more valuable.[1] It may be added that, as Mosso has pointed out, these respiratory and abdominal defects are of quite modern appearance, and by no means necessarily inherent in women. He points out that the models for the Venus of Milo and the Venus of Cnidos must certainly have been women trained in gymnastics and games. The conformation of the armpit of the Venus of Milo indicates a high degree of muscular

[1] In Stratz's *Schönheit des Weiblichen Körpers* is an interesting chapter on posture and movement in women, excellently and fully illustrated by photographs of the nude.

development of the chest, and the muscular development is particularly noticeable in the modelling of the abdomen; 'the rectal muscles of the abdomen are clearly seen; the upper part of the belly as far as the navel is divided by a line in the middle and one side, and on the other are seen two furrows marking the outer margin of the rectal muscles. I have not seen a modern statue in which this great development of the abdominal muscles was so well indicated.' There is no group of muscles which it is more desirable for a woman to possess in a developed condition than those of the abdomen.

In recent years the special conditions of physical education for girls have received more careful consideration. Thus in 1921 a Joint Committee of the London College of Preceptors was formed to consider this matter, being constituted of physicians, surgeons, physical trainers, and teachers. Among games, lawn-tennis and hockey were approved, and little objection was raised to cricket; lacrosse was approved, but football was by nearly all regarded as involving too much strain. Swimming, with proper precautions, was approved, but not considered suitable for all girls. Rowing was approved by most, but not racing in rowing. The value of dancing was of course generally emphasised. It was pointed out that, as regards all forms of strenuous exercise, short frequent periods were better than long occasional periods, and that there should be previous medical examination. While avoiding a final judgment, the committee was inclined to be in favour of voluntary continuance of games, sports, and gymnastics (swimming excepted) during menstruation.[1]

Some of the general questions involved in the consideration of the physical differences of boys and girls were brought forward in the report, published in 1923, of the London Consultative Committee on Differentiation of Curriculum for boys and girls in Secondary Schools. The Committee points out that the education of girls has

[1] *Brit. Med. Jour.*, 19 Aug., 1922.

passed through two stages and is now entering a third. In the first stage, which continued to 1850 and even later, it was assumed that the education of girls must be different from that of boys because girls belonged to the 'weaker,' or, more politely, 'gentler' sex. This was the stage of difference based on inequality, a stage of 'feminine accomplishments,' and also of educational inefficiency. In the next stage, now drawing to a close, the cause of efficiency was identified with equality, and educational reformers claimed that there should be no difference in the education of boys and girls. This was the stage of identity based on equality. It marked a great advance in efficiency, but it tended to crush women on 'the austere altar of sex equality.' In the third stage 'we can afford to recognise that equality does not demand identity, but is compatible with, and even depends upon, a system of differentiation under which either sex seeks to multiply at a rich interest its own peculiar talents.' This need not, and should not, involve any prescription beforehand of the respective spheres of the sexes. The Committee has found no ground on which such prescriptions could be based. 'We would prescribe as little as possible for either boys or girls because we are anxious that both should be free to find and to follow their tastes.' On the basis of these wise principles the Committee makes many reasonable recommendations. They desire no special consideration for girls as a 'weaker' sex because under right conditions girls can match the achievements of boys. 'But the conditions of health are not the same, and the freedom from other demands is much less for girls than it is for boys.' It is pointed out that, in actual practice, girls are often found to be more liable to physical and mental fatigue than boys, and often, being more amenable to authority and more industrious, are less able to protect themselves from over-pressure. Frequent medical supervision is thus required to prevent over-strain, both in work and games, which should not be made compulsory. The mischievous tendency to over-organisation in schools needs

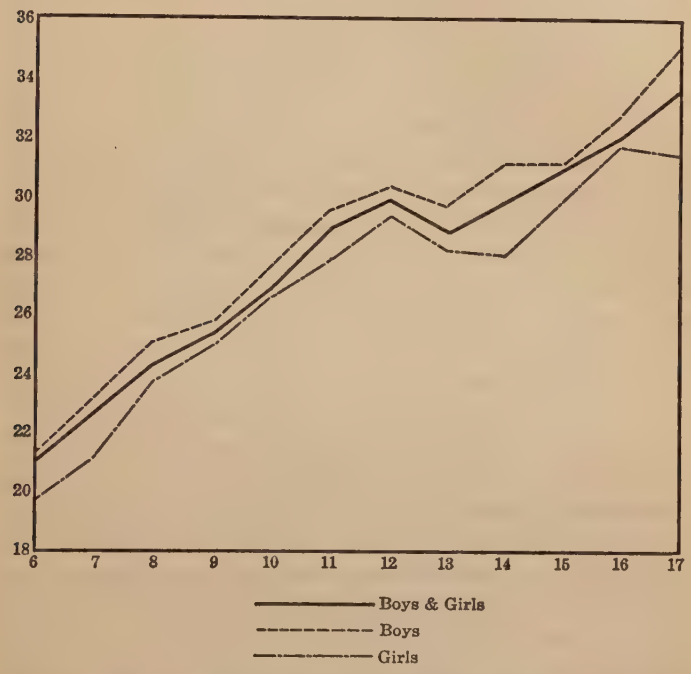
to be repressed; greater freedom should be allowed to the individual, and the time-tables modified so as to allow more free time.

If we now return to the consideration of special inquiries into motor ability, we find that Gilbert[1] investigated the sexual differences in voluntary motor ability with the aid of a special reaction-board with a button which the subject was required to tap as rapidly as possible for five seconds. Among over 1000 children at New Haven, between the ages of 6 and 17, it was found that rapidity increased with age to 12 years, being slightly lowered at 13, then increasing to a maximum at 17. Boys throughout showed a higher rate of tapping than girls.[2] Both sexes fall off at 12, but while the boys go on increasing in rapidity at 13, the girls continue to lose up to the age of 14, when there is the maximum sexual difference, and again fall off at 16, when the boys are steadily increasing in rapidity. The tendency of the girls to fall off at these ages is undoubtedly due, as Gilbert remarks, to the influence of puberty; and sexual physical development retards nervous development in other directions. In another series of experiments the tapping was continued for forty-five seconds, in order to judge of the influence of fatigue. This influence was found to be least marked at the age of 15; when the data were calculated separately for boys and girls, it was found that girls tire more easily at 13 than at 12, while for boys this occurs between 13 and 14. Boys tire more quickly than girls. At this point Gilbert makes some observations which are of considerable significance. 'Boys tire more *quickly* throughout,' he remarks, 'in voluntary movement than girls. But the statement that boys tire more *easily*

[1] *Studies from the Yale Psychological Laboratory*, II, 63.

[2] In another similar series of experiments at Iowa City, Gilbert found that from 6 to 8, the girls excelled the boys, though the boys tapped faster from 9 on to 19; the decline of the girls in rapidity at the age of 14 was, however, less than at New Haven. It may be noted, as possibly bearing on this difference, that the physical development of the Iowa children, irrespective of sex, was superior to that of the New Haven children. (*Iowa Studies in Psychology*, I, 1897, p. 27.)

than girls could scarcely be made upon the basis of my data, for the rate of tapping by the boys was faster than that by the girls. The statement that boys tire more *easily* is unwarrantable, for, by averaging and comparing the rate of tapping for all boys and girls separately, it is found that



the girls on the whole tap slower than the boys, who lose but little more than the girls by fatigue, leaving the balance in favour of boys. The average boy, including all ages, taps 29.4 times in five seconds; the average girl taps 20.9 times, thus tapping 8.5 per cent slower than boys. The average boy, including all ages, loses 18.1 per cent by fatigue; the average girl loses 16.6 per cent. In other words, the boys lose 1.5 per cent more by fatigue than girls, and yet boys tap 8.5 per cent faster than girls. This leaves the balance greatly in favour of boys when volun-

tary motor ability and fatigue are considered together.' This is an aspect of that more continuous character of women's activity, and more intermittent nature of men's, to which reference was made at the beginning of Chapter I. When women are working at their own natural level of energy, they tire less quickly than men do when working at their natural level of energy; but when women attempt to work at the masculine level of energy, they tire very much more rapidly than men.[1] This accords with the observations made in educational and industrial fields.

In practical life sexual differences in motor ability as shown in tapping may be studied in the telegraph offices. I am indebted to Mr. C. H. Garland for the following observations: 'Possibly you may know that in telegraphing use is made of a system of short and long currents, which, passing through electro magnets, move an armature working against a spring, depressing it for a longer or shorter time. This armature produces either a sound or prints a dash, or dot, on a paper ribbon. The currents are sent by a "key," which is essentially a brass lever pivoted in the centre, one end of which bears a handle. The other end is depressed by a spiral spring. When the handle is depressed the two contacts strike together and complete the circuit, and the electro magnets at the distal end of wire move armature in corresponding manner. Sending by hand on such a key requires considerable skill and delicacy, especially when high speeds of 30 to 35 words per minute are obtained. Mr. J. Grant, speaking before the Postmaster-General on December 18, 1893, made some interesting calculations, from which it appears that even

[1] Many other series of experiments, chiefly carried on in America, confirm those summarised above. Thus Christopher, experimenting on Chicago school children with the ergograph, found the boys superior to the girls throughout; the girls reached their maximum at fourteen, and from then on to twenty remained stationary; the boys increased continuously up to twenty, when their energy was nearly double that of the girls. Mary Harmon, among kindergarten children, found that in flexion and extension of the arm girls are notably slower than boys. Lewis, in comparing rate of movement in flexion and extension of arms, found that American males were decidedly superior to American females, and that Indians were intermediate.

when sending at the moderate rate of 20 words per minute, 300 signals are sent in each minute. The signals differ in length, and spaces have to be made of varying lengths between letters and words. From an experience of thirteen years, I can say that women are on an average slower senders than men. The men can for short periods send even at the rate of 45 words per minute, necessitating over 600 signals. The signals of the male clerks are cleaner cut, the distinctions between dots and dashes being more regularly and better made. The sending of women tends, as we express it, to "drag." The signals seem to slur into one another. The formation is more frequently faulty, although there are many excellent female clerks and many indifferent male clerks. I speak of averages. The handling of the key is another peculiar point. The normal method, and that producing the best results, is obtained when the key is grasped lightly by tips of index-finger, middle finger, and thumb. This is the common method by males. The females, however, show a tendency to "dance" on the key. That is to say, they frequently change the method of operation, alternately tapping the handle with the tips and the middle joints of index and middle finger, and grasping it. The hand is frequently lifted from the key in a sort of flourish, and has a peculiar effect when watched. The females on occasions change the position of their hand on the key two or three times during the formation of a single word. The rule seems to be to tap dots with tip of finger and dashes with middle. An experienced operator can in most cases distinguish by the marks received whether he has a male or female operator sending to him. Females also exhibit symptoms of fatigue on circuits, very quickly becoming impatient, and certainly appearing less able to talk and work at the same time. In conclusion, I might say that those stations where women are almost exclusively employed are notorious as being impatient, "snappy," and intolerant of any stumble.' In confirmation of Mr. Garland's observation that telegraph operators

can always form an opinion as to the sex of the operators with whom they are in communication, I may mention that I have been told by a female telegraph clerk that she has from time to time been addressed through the wires as 'old man' by clerks who cannot be persuaded that she is a woman.

Sexual differences may be traced in handwriting, though such differences are not easy to study by methods of scientific precision. Of recent years, however, efforts have been made to study handwriting exactly, with the aid of a special curvimeter and other instruments of precision. Thus Gross and Diehl, the latter working in Kraepelin's laboratory at Heidelberg, find that women write more rapidly than men. Their writing is also larger than men's, and the pressure they exert in writing is scarcely half as much as that exerted by men. But the women cannot increase their rapidity of writing to the same extent as the men, and such greater rapidity as they attain is due to diminution in the size of the writing, while in men it is produced by putting forth a greater effort.[1]

MANUAL DEXTERITY

Carl Vogt, whose opinion is entitled to consideration, speaking of his university experience in Switzerland, where there is so large a number of women students, while bearing witness to their quickness and excellent memory for what they have learned by heart, stated that they are not skilful with their hands. 'What makes laboratory work particularly difficult to women is — though one would hardly believe it — that they are often awkward and unskilful with their hands. Laboratory assistants are unanimous in complaining that they are questioned on the smallest matters, and that one woman gives more

[1] A. Diehl, *Psychologische Arbeiten*, III (1899), 37. More recently sexual differences in handwriting have been discussed by Ludwig Klages in his remarkable book *Handschrift und Charakter* (4th ed., 1921). He finds that at least 15 per cent of women show masculine traits in their handwriting, and 10 per cent of men feminine traits (p. 163).

trouble than three men. One would have thought that the delicate fingers of these young women were specially adapted for microscopic work, for the manipulation of thin *laminæ* of glass, and the preparation of minute sections; but it is the contrary that really happens. One recognises the place of a female student at a glance by the fragments of glass, broken instruments, notched knives, the stains of chemicals and colouring agents, the spoiled preparations. There are exceptions without doubt, but they are exceptions.' [1] This point is of some interest, and through the kindness of a friend I obtained the opinions of several experienced and well-known teachers as to the relative awkwardness of men and women in manual operations. The letters in response cover rather more than the ground of awkwardness, but they are worth quoting. Professor M'Kendrick, of Glasgow University, wrote: 'My experience has been that women are, on the average, as neat and strong and deft in manipulation as men. By "strong" I mean that they possess sufficient and well coördinated muscular power in their fingers, hands, and arms. Lightness and firmness of touch always imply a well-ordered muscular mechanism. In my opinion there is no average difference between the sexes as regards the capacity of performing dexterous manipulations. A certain percentage of both men and women are clumsy and inept in the movements of their fingers, and my experience does not lead me to think that the percentage is greater in women than in men. Some men possess delicate touch combined with much patience in manipulative work, and some women show the same excellences. At the same time I cannot admit that women, on the whole, are better adapted for delicate manipulative work than men. It really resolves itself into this, that many women can, in this matter, do what any man can do, and that many men can do what any woman can do. This is the result of experience in teaching women for about twenty years.'

[1] Carl Vogt, *Revue d'Anthropologie* (1888).

Professor Halliburton, of King's College, London, wrote: 'My answer would be of much more value if I could give definite statistics, but as I have kept none, all I can do is to state my general impressions. The success of women students at examinations in science will in part answer your inquiries, but though examinational success is evidence of one kind of ability, it is not, unless taken in conjunction with other things, of superlative value in my eyes. I should rather look to the general work of the students, such as one sees in a practical class. On the whole, then, I should say that women students are on the average better than men students. This may be in part owing to the fact that women do not take up scientific work unless they are earnest about the matter and have some scientific ardour; with men one finds a large class who have no interest in their work, and who, in spite of their laziness or stupidity, or both, have been sent to college by their parents and guardians. The best women students are not, however, so good as the best men. They do not get the same grasp of the subject; they are more bookish and not so practical; they excel, however, in an infinite capacity for taking pains, such as one seldom if ever sees in a man. With both men and women one often finds that good ability, intelligence, industry, and extensive theoretical knowledge are combined with an inability to do practical work. This is not, however, the rule in either sex. Still, every now and then we come across instances of people who are not able to use their fingers, be they ever so industrious or gifted in other ways; and my further impression is that one meets with this more often in women than among men.'

Mr. Vaughan Jennings, who taught Biology to mixed classes at the Birkbeck Institute for several years, wrote: 'I think that in the matter of manipulation men are on the whole better than women. In a class equally divided I should expect, I think, to find more men than women showing natural skill in dissection or in using delicate apparatus. (If one had to select a number of untrained

recruits to learn such work one would choose them mainly from sailors.) At the same time the men who have no capacity for such work are likely perhaps to be worse than the average woman, probably because they take less trouble. It is difficult to say where the difference lies. It is impossible to tell how much inherited habit has to do with any of the mental differences between the sexes. Some difference in the nervous system seems to be at the root of most of it. A certain lack of initiative and a hesitation about "taking the next step" seems to cause a good deal of apparent slowness. I am sure also that greater nervous irritability is responsible for much. The ordinary words "nervousness," "impatience," etc., do not express what I mean — but there is a sort of almost unconscious and automatic exhaustion of the nervous system which often spoils delicate handiwork; and the strong man with the heavily-balanced nerves has a far greater advantage than is generally believed. However, this is only theory. My opinion is by no means a strong or decided one, but I think on the whole it goes to the masculine side.'

It will be seen that the writers of two of these letters (which, I may add, were addressed to a lady) cautiously support Vogt's experience, though with nothing of his characteristic *brusquerie*. The opinions as to the greater awkwardness of women students in manipulation are three to one, while M'Kendrick, who forms the minority, guards himself from the assertion that women are less awkward than men. More recently Heymans has carried out a larger inquiry among Dutch professors which still more emphatically confirms the greater skill of men in manual skill in laboratory work. Only one professor regarded women as more skilful, while twenty assigned the superiority to men (ten finding no sex difference), and this result is the more notable, Heymans remarks, since it is contrary to our prepossessions.[1] That women possess in specially high degree the 'well coördinated muscular

[1] Heymans, *Die Psychologie der Frauen*, 129.

power' which, as M'Kendrick points out, is involved in skilful manipulation, there is, so far as I am aware, no precise experimental evidence to show; while, as we shall see later on, the 'nervous irritability' invoked by Jennings is an important factor in the activities of women.

It is not easy, as I have elsewhere had to point out, to compare the relative skill of men and women workers, because men and women rarely perform the same work under the same conditions. The cigar and cigarette trades furnish a good field for comparison; this work requires in its more important branches considerable manual dexterity and neatness, and a quick, accurate eye. It does not call for great muscular strength, and is therefore well fitted for women; as a matter of fact, in East London and Hackney cigar-makers are in the proportion of about 800 men to 1100 women and girls.[1] The women, however, speaking generally, are set to do a lower class of work; they receive from 15 to 40 per cent less wages than the men, and it seems to be generally agreed that their work is inferior. It should be added, however, that the physique and intelligence of the men are reckoned as above the average. A large number of women and girls are employed as cigarette-makers. This, it need scarcely be said, requires long practice and great dexterity, especially when, as is now the case, so narrow a margin of the paper is allowed to overlap. All the best work is at present done by men; the women are employed chiefly in what is called 'push work,' which means that the paper wrapper is first constructed and the tobacco inserted subsequently; this is much less skilled work and produces an inferior kind of cigarette. In Leeds also, according to Miss Collet, experience seems to be in favour of men's work; in the cigar trade there men are said to have a lighter touch than women, and to produce cigars, as a rule, of more equal

[1] See in Booth's *Labour and Life of the People* (1889), I, the interesting chapter VI on 'Tobacco Workers,' from which the facts stated above are mainly taken.

quality.[1] In American tobacco factories opinion seems to be more favourable to women's work than in England. In four establishments the men were said to be more efficient than the women; in one the women more efficient than the men; in four the men and women were said to be equal.[2]

In cotton weaving (though not in cotton spinning), both in England and France, it appears that men and women are equal, and women (even as far back as 1824) have earned as much or nearly as much as men.

There is, finally, at least one occupation, chiefly involving manual dexterity, in which women are stated to be distinctly superior to men. Women stitch the serge linings to saddles as well as men and 40 per cent more quickly. They are paid at the same rate, and earn 35*s*. a week as against 25*s*. formerly earned by men. It is an occupation for which women have been more highly trained than men.[3]

There is a general belief that women are nimble and dexterous with their fingers. If, however, we except needle-work, in which women are as a rule forced to possess the skill that comes of practice, there seems reason for concluding that on the whole the manual dexterity of women is somewhat inferior. Helen Thompson in Chicago found that manual dexterity is slightly greater in men, though quick power of making new coördinations was greater in women. The latter result is supported by Wells's experiments with the tapping test, and reference may be made to the greater readiness of women to turn to a new occupation, and similar allied characteristics brought out by Heymans's *enquête*.[4] This deficiency in dexterity

[1] Clara E. Collet, *Economic Journal*, Sept., 1891

[2] *Eleventh Annual Report of United States Commission of Labour*, 517. There are incidental advantages in women's work, as they do not smoke themselves (in which case they could claim tobacco for personal use), and are said always to be at work on Monday morning.

[3] I quote the two last cases from an able discussion by Sidney Webb, 'Alleged Differences in the Wages paid to Men and to Women for Similar Work,' *Economic Journal* (1891), 635.

[4] Heymans, *Psychologie der Frauen*, 279.

seems to be more marked in the more special and skilled departments of work. Thus, Mr. Webb remarks, 'women weavers can seldom "tune" or set their own looms. Women heraldic engravers have, curiously enough, never been able to point their own gravers, and have, in consequence, nearly abandoned that occupation.' In such cases as this we have, no doubt, to deal not so much with defective manual dexterity as with a certain lack of resourcefulness and initiative, and especially with the lack of interest on which Heymans insists.

SENSE-JUDGMENTS

Under this heading we may include various phenomena which, although closely related to pure sensory impressions, are more highly complicated by muscular, reflex, and intellectual factors. The power of forming rapid and accurate sense-judgments is of great importance in practical life. Unfortunately, it is not easy to find or even to devise reliable investigations regarding the relative skill of men and women in forming sense-judgments; it is rare to find men and women working under absolutely the same conditions at absolutely the same work.

In the business affairs of life, where we may reasonably expect to find natural selection operating to effect a true sexual distribution, the evidence is conflicting. In salt-making, women often perform work elsewhere done by men, and are said to be more 'neat-handed' in 'tapping the squares'; at the same time they do less work than men, two men taking the place of three women.[1] In America an experienced peach-grower has asserted that women have quicker and defter fingers than men (as well as more natural honesty), and that they make better graders and packers than men. As money-counters, women in America are said to be much more expert than men, seldom making a mistake or passing counterfeit coin. They can tell a bad bill by feeling it only, it is asserted, and a bank

[1] S. Webb, *Economic Journal* (1891).

cashier will make a hundred mistakes where they make one. All these assertions are a little dubious.

If we turn to the more accurate and measurable determination of sexual differences in the formation of sense-judgments, it is possible to find a few, though not many, attempts to measure accuracy of motor response to sensory impressions. A few tests were applied at the Anthropometric Laboratory of the British Association. It was found that in dividing a line in half women's eyes were absolutely correct in 10 per cent more cases than those of men. The division of a line into thirds was done about equally correctly by both sexes, while the men were considerably more accurate than the women in estimating a right angle. In investigating New Haven school children Gilbert found that in judgment of weight-differences both boys and girls improve with age. At six the boys are decidedly superior to the girls, from seven to thirteen they oscillate but on the whole keep pace with each other; after that there is a decided superiority of boys. Helen Thompson also found that in discriminating weights men are much more accurate than women. At Iowa Gilbert further investigated the accuracy with which space is judged in terms of movement: the subject having first had an opportunity of measuring the distance between two points with his eyes, had then to mark it off with eyes covered. Accuracy increased with age; between the ages of six and ten girls were more accurate, but after that boys became more accurate. In the estimation of length by sight, it may be remarked, Gilbert found that at nearly all ages boys are more accurate than girls.

Franz and Houston in New York found that in estimating time, distance, proportion, and in quantitative measurements generally, boys are more exact than girls.[1]

Jastrow, in experimenting on the male and female students of Wisconsin University, devised a series of tests

[1] Franz and Houston, *Psych. Rev.*, Sept., 1896. These results agree with those of Bolton.

of sense-judgments, relating to pressure and to the space-sense of the skin. The subjects were first required to pour as much shot in the palm of their right hands as they thought would weigh an ounce; the men on the average displayed an exaggeration of 65 per cent; the women on the average an underestimation of 21 per cent. The subjects were next asked to pour shot into a box so that both shot and box should weigh an ounce; in this test a well-recognised illusion was involved, as a stimulus appears less intense when spread over a larger area; both men and women largely exaggerated the amount necessary, but the exaggeration was somewhat greater in the case of the men. When the operation was repeated with the intention of making box and shot weight one pound there was a slight exaggeration with the men, but the women's error was very small. The subject was then given the box which he considered to weigh one pound, and asked to put sufficient shot into another box to make it weigh double the first; in this test the women were very slightly more successful than the men. The space-test consisted in separating the points of the æsthesiometer on the back of the subject's hand until he regarded the distance between the points to be one inch; both men and women overestimated the separation necessary, the men slightly more than the women.[1] Jastrow's observations without exception show greater accuracy of judgment on the part of the women; here, however, it must be borne in mind that the experiments were made through the medium of the dermal sensations of the hand, and, as has already been pointed out, such experiments place men at a disadvantage from the outset, and have little value in determining sexual differences in natural faculty. They have, however, a certain value in relation to the practical affairs of a world in which men and women must be accepted as they stand, since it is thus demonstrated that the coarsening of the skin by rough usage is a real disadvantage in forming sense-judgments.

[1] Jastrow, *Amer. Jour. Psych.*, April, 1892.

CHAPTER XI

THE UNCONSCIOUS

The various phenomena here included under this term — Somnambulism — Hypnotism — Ecstasy — Trance — Catalepsy — Magic — Women have played a larger part in nearly all.

Dreams — Women as dreamers among primitive races — In the Middle Ages — In modern times.

Hallucinations in the sane — Sidgwick's investigation — Greater prevalence among women.

The action of anæsthetics — Nitrous oxide — Silk's observations — Abnormal action under anæsthesia more marked in women.

Meteorologic sensibility — Suicide — Insanity — Conclusion as to sexual difference doubtful — Periodicity in growth.

Functional, psychic, and nervous troubles — Hysteria — Its characteristics — Suggestibility — Relative frequency in the sexes.

Religious phenomena — Nature of the part played by women in religious movements — Shakers — Dancing mania — Camisards — Modern hysterical religious epidemics — Christs — Skoptsy — Religious phenomena among uncivilised races — Nature and causation.

In here using the term 'unconscious' we are to understand the various psychic manifestations which are not in direct or immediate contact with our ordinary consciousness. The term 'subconscious' is sometimes used. I have sometimes used the term 'hypnotic phenomena,' thereby meaning psychic manifestations analogous to those exhibited during sleep. It should be added that we are not here concerned with any of the theories put forward by Freud to explain the 'unconscious.' They may be either accepted or denied; we are here only concerned with definitely ascertainable phenomena in their relative sexual incidence. Strictly speaking, it is not unconsciousness we here encounter but rather, for the most part, consciousness upon other than normal planes. We are dealing with all those groups of psychic phenomena which are characterised by a decreased control of the higher nervous centres, and increased activity of the lower or deeper centres. These groups of phenomena are closely related, and are all marked by diminished normal consciousness of the subject, or diminished power of control, or both. Taken

altogether they constitute the phenomena which have often been called 'superhuman,' but which, as Chambers long ago remarked, may quite as truly be called 'subhuman.' The best known of such phenomena is that which we have all experienced during ordinary sleep, perhaps the most primitive and fundamental form of consciousness.

That modified kind of sleep, the condition of ordinary somnambulism or sleep-walking, in which the motor centres are awake and respond to ordinary stimuli while the higher centres are asleep and fail to control the responses of the more automatic centres, is fairly common to a slight degree, or at rare intervals, especially among children.[1] There are no exact statistics, so far as I am aware, as to its frequency among adults; the majority of those who have occupied themselves with the subject seem to regard it as more common in women, or have at all events found the worst and most persistent cases in women.

The phenomena of mesmerism, animal magnetism, etc., now usually grouped under the head of hypnotism, have always been specially identified with women. Women have most easily fallen under their influence, and the chief advances in our knowledge of hypnotism have come through investigations on women. One or two enthusiasts have declared that most persons, taken at random and irrespective of sex (80 per cent according to Liébault), are hypnotisable. It is probably true that, with the exercise of sufficient skill and patience, the phenomena might be elicited in everyone possessing a fair degree of mental health (for it is notoriously difficult to hypnotise the insane even with the exercise of very considerable skill and patience), but it remains true that, in the experience of the most skilful investigators, women more easily fall into the hypnotic condition, and exhibit the phenomena in a more marked form. In the hypnotic *cliniques* of forty years ago

[1] Dr. E. von der Stein (*Ueber den natürlichen Somnambulismus*, Heidelberg, 1881) found by investigating orphan asylums in Baden that out of 1000 children 17 (or 1.7 per cent) showed somnambulistic phenomena; there were not necessarily any signs of neuropathic constitution.

women were in a great majority. Thus Pitres, a chief authority, found that with the greatest possible persuasion two-thirds of hysterical women, and only one-fifth of hysterical men, could be hypnotised.[1] Again, Bérillon, an enthusiastic and at the same time judicious believer in hypnotic therapeutics, during 1890 and the early part of 1891 (as he stated at the Berlin International Medical Congress), treated 360 patients by hypnotism; of these 265 were women, 45 were children, only 50 were men — a statement agreeing with my own recollections of Dr. Bérillon's *clinique* at about the same period. These figures do not necessarily indicate the sexual proportion of hypnotisable persons among the general population, but they at least show that a comparatively small proportion of men can be treated by hypnotism with any chance of success. It may be added that children may easily be put into the hypnotic state: Beaunis found that out of 100 children between seven and fourteen years of age, 55 are hypnotisable, and Bérillon considers that this is below the truth, as he finds that most children above the age of seven, provided they are not idiots, may easily be hypnotised.[2]

The allied phenomena of ecstasy, trance, and catalepsy, it is generally agreed, are more frequent in women, and it may be added that the most remarkable cases on record, with few exceptions, occurred in women. In catalepsy the subject's mental functions are largely or altogether suspended as regards the external world; the muscles are passive and retain any position in which they may be placed. In ecstasy, which cannot be very clearly distinguished from trance, there is not the same absence of muscular control, and the subject's mental functions, instead of being suspended, are actively employed in seeing visions; during the trance the subject's countenance expresses inspired illumination of a seemingly more than

[1] *Leçons cliniques*, etc., II, 404; also Grasset, *L'Hypnotisme et la Suggestion* (1902), 93.

[2] E. Bérillon, *Hypnotisme et Suggestion* (Paris, 1891), 37.

earthly character, and on awaking he is able to recall his visions, which have played a considerable part in the world's spiritual history. Both catalepsy and ecstasy are allied to hysteria, but are not necessarily identical with it.[1]

All the phenomena which of old were termed 'magical' come under the group here termed 'hypnotic,' and they have always been regarded as especially connected with women. Pliny tells us that women are the best subjects for magical experiences. Quintilian was of the same opinion. Bodin estimated the proportion of witches to wizards as not less than 50 to 1.[2] The oracles, which in various religions are given out in a more or less hypnotic state, usually emanate from women. This was not only the case among the Greeks but also among the ancient Babylonians and Assyrians. In a series of eight oracles addressed to Esarhaddon, Morris Jastrow records that six were given out by women.

It is interesting to find that magical phenomena corresponding to those to be found in remote districts to-day in England (where witches — white and black — still flourish, and 'ill-wishing,' though not always avowed, is firmly believed in) existed in a substantially similar form six thousand years ago in the oldest historical civilisation. It was a widespread and apparently already very ancient belief among the Babylonians and Assyrians that certain human beings possessed demoniac powers, and could exercise them for evil on whomsoever they pleased. Such sorcerers could be either male or female, but they were

[1] The short articles, 'Catalepsy,' 'Ecstasy,' and 'Trance,' by Hack Tuke in the *Dict. Psych. Med.*, may be consulted; also the excellent articles (though written long ago) by Chambers on 'Ecstasy,' 'Somnambulism,' and 'Catalepsy' in Reynolds' *System of Medicine*, II; for an elaborate study from a more modern point of view of the differences between catalepsy, ecstasy, lethargy, somnambulism, etc., regarded as typical and mixed forms of hypnosis among the hysterical, see Pitres, *Leçons cliniques sur l'Hystérie et l'Hypnotisme* (1891), II, 117–42.

[2] Millingen, *Curiosities of Medical Experience* (1857), I, 225; also J. Grimm, *Teutonic Mythology* (translation), 1038–41; Tuchmann (*Mélusine*, 1888, p. 346) gives opinions and references bearing on the greater frequency of witches than of wizards.

mostly female. These witches, Jastrow remarks, are so closely associated with demons in the Babylonian incantation texts that we may regard the witch as merely the person through whom the demon has manifested himself. From the basis of this identity the witches reached a stage through which they could control the demons, though the demons could not control them. The Babylonian witch's 'evil eye' had great power, as had also her 'evil word' (or magic formula) and her potions made from poisonous herbs. We also find that all the more indirect devices of what may fairly be called modern witchcraft were well known to the Babylonian woman. By sympathetic magic she could strangle her victim by tying knots in a rope, or by making an image of him in clay, pitch, honey, or fat. She could symbolically burn, torture, bury, or drown him.[1]

It is equally remarkable to find similar phenomena of witchcraft flourishing among savages on the other side of the world. Malinowski has given a detailed account of their activities among the Trobriand Islanders of New Guinea. These witches are women — for the male sorcerers are few and not nearly so deadly as the women — who have the power of making themselves invisible, it is said, and of flying through the air at night; they are believed to be able to send forth doubles who can also be invisible but may take the form of a flying fox or a night bird or a firefly. They are said to possess magical formulæ for their purposes and to utter spells, but Malinowski doubts if such spells are really used.[2] Among some tribes the supposed witches abound, though a woman never directly admits that she is a witch.

Again we find the same phenomena flourishing in ancient Peru. The Spanish invaders, as Garcilasso de le Vega recorded, found among the Incas that there were sorcerers and witches, and most commonly the profession

[1] Morris Jastrow, *Religion of Babylonia and Assyria* (1898), 266.

[2] B. Malinowski, *Argonauts of the Western Pacific* (1922), chap. X.

was exercised by the women. From envy, or other evil motives, he states, these women could by witchcraft produce the same results as would be obtained by poison.[1]

As we have seen, women in many parts of the world are apt to deny in public that they possess the arts of witchcraft and are not prone to acknowledge the mysterious powers with which they are credited, even though these powers add to their influence in the community. But at various periods and in various regions a different attitude has prevailed. The women have consciously admitted and exploited their special powers and privileges by forming secret societies. This is, for instance, the case in West Africa where in certain tribes what is called the Njèmbè exists. These are secret societies of women, the existence of which is well known though exactly what goes on in them is unknown. No woman, not even if she later becomes a Christian, has ever revealed these mysteries. 'Nothing is known outside the society of their doings in their camp,' says the Rev. R. H. Nassau, M.D., 'except that they are all naked, lay aside all modesty, make personal examination of each other's bodies, sing phallic songs, and indulge in the hardest, severest and most violent insults and curses heaped up in assumed wrath as jokes on each other.' The Rev. J. L. Wilson states that the original object of this institution was undoubtedly to protect women from harsh treatment by their husbands, for they are believed to possess special powers. 'It is still true,' Nassau adds, 'that in the tribes where Njèmbè exists women have much more freedom from control by men than in tribes where it does not exist.'[2]

Woman as witch tends to resemble woman as priestess, though they remain essentially distinct since the witch is

[1] Garcilasso de la Vega, *Royal Commentaries of the Yncas*, Hakluyt Society, I, 60. In yet another quarter of the world, Westermarck states that in Morocco women are considered specially skilful and potent in sorcery, *Ritual and Belief in Morocco*, I, 571.

[2] R. H. Nassau, *Fetichism in West Africa* (1904), 260; J. L. Wilson, *Western Africa*, 397.

an uncanny creature because believed to be associated with the powers of evil, while the priestess is revered as sacred. But there was often magic in the power of the priestess. In classic antiquity Farnell finds ground for not accepting the view of Jevons that agriculture was invented by woman and that for this reason agricultural religions have priestesses (as in the Thesmophoriæ), and equally disputes the view of Karl Pearson that we are concerned with the relics of the early matriarchal ages when women held all the religious power. Farnell holds that women are always more fitted *psychologically* for religion. 'They held the stronger magic because they could put themselves more easily into sympathetic rapport with the earth goddess, because the generative power of the latter, which the ritual desired to maintain and to quicken, resembled more nearly their own.' The Thesmophoriæ were not licentious orgies; they were performed by married women only, and chastity was strictly enforced.[1] 'The ancient world was full of priestesses.' [2]

Among various peoples of lowly culture to-day we find priestesses who are not, like witches, in league with evil spirits but whose function it is to drive them out. This is so, for instance, among the Dusuns of Borneo as described by Evans. 'Certain initiated women,' he says, 'are the priestesses upon whom rests the successful carrying out of the rites. Men, though present, play only a subordinate part in the performance, the duty assigned to them being that of providing a musical accompaniment to the women's chants.' The young women pay a fixed fee to enter the ranks of the initiated and the training takes three months. They use a secret language and Evans describes their rites. This tribe formerly made human sacrifices.[3]

The hypnotic and 'magical' aptitude of women is thus doubtless a fact of their organisation. But its development

[1] L. R. Farnell, *The Cults of the Greek States*, III, 106.

[2] Briffault, *The Mothers*, II, 514. He here brings forward much evidence on this point.

[3] J. H. N. Evans, *Jour. Anth. Inst.* (1912), 381.

has certainly been favoured by the wonder excited by that physical mystery of womanhood, to which reference was made in Chapter I. Women in savage and barbarous stages of existence are believed to have a strange influence over the whole of nature, and in the early civilisations the magical influence of the nakedness of women seems to have been specially marked. It was so on the banks of the Nile where woman could thus exorcise demons; Wiedemann states that for this reason figures of naked women were used as amulets. Pliny [1] tells us that 'on the approach of a woman in this state [the menstrual], meat will become sour, seeds which are touched by her become sterile, grafts wither away, garden-plants are withered up, and the fruit will fall from the tree beneath which she sits,' etc. In Holland to-day, it is believed that if a woman at her period steps over young plants, she will cause their death, though, on the other hand, by stepping over cabbages she may thus rid them of caterpillars. At Bordeaux and on the Rhine women must still avoid entering wine-cellars during their periods. Women possessed a favourable as well as unfavourable magic influence: in another part of his work (Book XXVIII, c. 23) Pliny writes: 'Hailstorms, they say, whirlwinds, and lightning even, will be scared away by a woman uncovering her body while her monthly courses are upon her. The same, too, with all other kinds of tempestuous weather; and out at sea a storm may be lulled by a woman uncovering her body merely even though not menstruating at the time. Also, if a woman strips herself naked while she is menstruating, and walks round a field of wheat, the caterpillars, worms, beetles, and other vermin will fall from off the ears of corn.' Many of these beliefs survive in Italy (and in other parts of the world) up to the present day; thus at Belluno, according to Bastanzi, it is customary for a priest and a naked young girl to go (separately as a rule) early in the morning into the fields to drive away the caterpillars. (The introduction

[1] *Natural History*, Book VII, c. 13.

of the priest is an example of the way in which Christianity has sought to sanctify the Pagan rites it could not eradicate.) To some extent this belief in the influence of nakedness has been extended to masculine nakedness. This is so to-day in the Balkans, and Deutsch has described the way in which, in some Serbian town in which plague had gained a footing, on Sunday at midnight, at the new moon, twelve naked maidens with twelve naked youths, of unspotted reputation, would be yoked together to the plough and so make a circuit of the town; it was absolutely necessary that no one must touch his or her yoke-fellow; any lustful glance would destroy the magical influence. Again, when disease breaks out among the cattle, naked men and women make a loud noise with pots and kettles, constantly singing the words:

> 'Fly away, disease, fly away,
> Where nakedness is you cannot stay.'

Thus the wonder excited by women has in the past, if not in the present, powerfully reinforced the influence they have gained through what I have broadly termed 'hypnotic phenomena.' [1]

A large part of the fascination which women possess for men lies in their liability to such manifestations as we have here to consider. It has been a mystery which men have never grown tired of contemplating, and which has left an ineffaceable mark on the literature produced by men.

The mystery has been sympathetically described by Diderot, who himself combined the man's temperament and the woman's, in his rhapsodical fragment 'Sur les Femmes': 'It is especially in the passion of love, the attack of jealousy, the transports of natural tenderness, the instincts of superstition, the way in which they share popular epidemic emotions, that women astonish us, beautiful

[1] Many facts bearing on the prevalence of the belief in the magical aptitudes of women, both in ancient and modern times, are brought together by Ploss, Bartels, and Reitzenstein, *Das Weib* (11th ed.), Bd. III, 295–316; these authors believe that such phenomena are of universal extension and probably constitute a fundamental human belief.

as Klopstock's seraphim, terrible as Milton's angels of darkness. I have seen love, jealousy, superstition, anger in women carried to heights which man has never reached. . . . A man never sat at Delphi on the sacred tripod. The part of Pythia only suited a woman. It needs a woman's head to feel seriously the approach of a god, to become exalted and agitated, dishevelled, foaming, to cry out: "I feel him, I feel him, the god is come!" and then to repeat truly his words. In her hysterical delirium she sees the past over again, she is projected into the future, all times are present to her. Nothing closer together than ecstasy, vision, prophecy, poetry, and hysteria.' And he added: 'More civilised than men outside, within they have remained true savages.'

DREAMS

Among primitive peoples the dreams of women often play an important part. In the Lake Shirwa district of Central Africa, for example, very sacred functions are performed by the prophetess. It is to her that the gods or ancestral spirits make known their will, and this they do in dreams. The prophetess, who is frequently one of the chief's wives, dreams her dreams and then gives forth oracles at intervals, according to the exigencies of the case; they are usually delivered in a frenzied state.[1] It seems clear, however, from the description given of the emotional and other phenomena accompanying the delivery of these oracles, that they are largely manifestations of hysteria. Nor, if we take savage races generally, can it be said that these phenomena are more common among women; we find them fully developed among men.

It is not until we turn to races which have reached a high degree of barbarism that we find clear evidence concerning the relative frequency of dreaming in the sexes. The old French epic cycles furnish us with interesting material for the study of this question in mediæval Europe; and the

[1] James Macdonald, *Jour. Anth. Inst.*, Aug., 1892, p. 105.

dreams of the Arthurian and Karolian epics have been carefully studied by Mentz.[1] Dreams are represented throughout these cycles as of great importance and significance; they are visions from God. Heroes and princes were great dreamers; heathens rarely or never. The greatest dreamer of all was Karl the Great, though only when he was young and vigorous. But women dreamed much, and Mentz argues from this that they must have been highly thought of. 'These poets have with special preference attributed dreams to women, and this is shown not only by the number of examples of women dreaming, but by some very remarkable cases. For example, when any common misfortune overtakes a married couple or two lovers, it is always the woman who receives information of the misfortune.' After giving numerous examples, Mentz adds: 'I have not found a single case in which, on such an occasion, the dream has come to the father or the husband; the dreamers are always women. Women's parts are filled with dreams, which otherwise are only imparted to heroes and princes.'

In modern times dreams have lost all divine significance, although they have acquired a new scientific value as helping to furnish the key to many psychological problems of the past and the present.[2] The sexual difference begins in early childhood and girls are precocious dreamers. Thus Fernanda Banchieri in Italy found that at the age of three, 23 per cent girls dreamed, but only 11 per cent boys; at the age of five, 28 per cent girls and 20 per cent boys. The more intelligent the children the more they dreamed.

The results of an investigation of the dreams of more than 5000 children in elementary, secondary, and industrial schools were brought before the Child-Study Society by Dr. C. W. Kimmins at the end of the Great War. His analysis, based on written records, of the dreams of boys

[1] Richard Mentz, *Die Träume in den altfranzösischen Karls- und Artus-epen* (1888).

[2] See, e.g., S. Freud, *The Interpretation of Dreams*, and Havelock Ellis, *The World of Dreams*.

and girls, to the number of over 5000, showed that boys had far more fear dreams than girls. Fear of burglars and robbers appeared twice as often among the dreams of boys of the elementary schools as it did among those of the girls. Fear of animals was practically the same in both sexes, and was the cause of some 20 per cent of the fear dreams. Boys had more kinesthetic dreams than girls, these dreams including the sensation of falling or excessive motion or loss of muscular control in movement or speech. Although the normal child was associated with the school for half his waking hours, few dreams had any direct reference to school activities. Girls' dreams were more influenced by the school than boys', but the number was almost negligible. A book read just before going to bed affected the dreamer, and the child nearly always played the part of one of the leading characters. The dreams showed a large proportion of wish elements, relating to home life, visits, and parcels. Children of 12 or 13 dreamed less than younger and older children, and dreams at that age appeared to have a morbid tendency.[1]

There can be no doubt whatever that women are greater dreamers than men. While men, as they reach adult age, usually find that their dreams become rarer and less vivid, receding into a dim background where they can with difficulty be perceived, though doubtless always present, in women dreams usually remain frequent and vivid. This fact is familiar to all who have inquired into psychological phenomena, and it has often been confirmed by statistical investigation. Thus Heerwagen found that women dream more than men, whilst male students stand as a class between other men and women. Sante de Sanctis, in his valuable study of dreaming, 'I Sogni,' found that only 13 per cent men dream always as against 33 per cent women. Dreaming reaches its maximum intensity at from 20 to 25 years of age. Married women, according to Heerwagen, dream less than the unmarried. A dreamful

[1] *Brit. Med. Jour.*, 30 Aug., 1919.

sleep, Heerwagen found, is in women more likely to be prolonged than a dreamless sleep; but it is not so in men. Men, it may be added, sleep more soundly than women, while sleep is soundest in childhood.

Jastrow, in an interesting study of the dreams of the blind,[1] finds reason to believe that the blind are not, on the whole, such good dreamers as the sighted, but the sexual difference probably remains unimpaired. While of the males 54.5 per cent dream seldom, 19.2 per cent frequently, and 7.1 per cent every night, similar numbers for the females are 29.8, 26.2, and 8.3 per cent — i.e., the females include more 'frequent' and fewer 'occasional' dreamers.

As to sexual differences in the character of dreams and the modes of dreaming, we possess little definite evidence. I will only allude to a study of 'The Statistics of "Unconscious Cerebration" '[2] by Charles M. Child, of Wesleyan University. This investigation, carried out under the superintendence of Professor A. C. Armstrong, was made on 200 college students (151 men and 49 women). It does not refer exclusively to dreaming, but various points bearing on dreams came within its scope. Thus it was found that only 12 per cent of the women remember having any logical or connected train of thought in a half-sleep, but the general percentage is twice as large. The low percentage of the women here may be connected with the fact, which was also brought out in this investigation, that a large percentage of women wake directly. It was found that the dreams of women are more affected by position than those of men, and that a larger percentage of women than of men are conscious of a moral sense when dreaming. Possibly the greater vividness of women's dreams may account for this. After 30 years of age consciousness of moral sense in dreams diminishes. Persons under 25 are least affected by position, probably because at this age

[1] *New Princeton Review*, Jan., 1888.

[2] *Am. Jour. Psych.*, Nov., 1892, V, no. 2.

dreaming is a more constant and normal phenomena. There was a continuous decrease with age in the number of those who dream, although sexual differences in the number who dream (apart from the vividness, etc., of the dreams) were found to be trifling. The figures show a slightly larger proportion of men than of women who talk in their sleep, but the percentage of women who answer questions when asleep is much larger than that of men (56 per cent as against 32 in men). While the men can usually only answer questions on the subject they are talking about, the women can more often answer questions on any subject. The percentage of those who talk in their sleep is much higher under 25 years of age than above, and the ability to answer questions also diminishes with age.

Wynaendts-Franken (at the International Congress of Psychiatry in Amsterdam in 1907) found among three hundred people that men dream in 54 per cent cases, women in 75 per cent. Dreams of colour occurred in 48 per cent men and 74 per cent women; of sound in 30 per cent men and 58 per cent women. Dreams tending to arouse emotion were noted in 57 per cent men and 81 per cent women. Women were more often awakened by dreams than men, and some of them experienced continued dreams; they were also less able to distinguish dreams from reality. Dreams of fulfilled wishes occurred in 23 per cent men and 43 per cent women. Prophetic dreams were recorded in 7 per cent men and 24 per cent women.

Day-dreaming when awake is also found to be more frequent in women; Mabel Learoyd found that three and a half times as many women as men carried on systematic day-dreams (46.7 per cent women to 13.5 per cent men).

HALLUCINATIONS IN THE SANE

Hallucinations of the senses occurring under ordinary conditions, when the subject is in fair health and otherwise sane, are very closely allied to the dreams that occur during

sleep.[1] Their occasional occurrence has often been recorded, at times in men of genius as well as in persons under mental stress.[2] They may also be produced as a kind of embryonic hypnotic suggestion in ordinary life, and it has been found that such hallucinations are more easily produced in women, children, and the uneducated, although by no means exclusively in them.

Our chief source of statistical information concerning their frequency in the general population is still the inquiry into the nature and frequency of hallucinations of the senses occurring to sane persons, conducted by Henry Sidgwick.[3] As the affirmative or negative experiences of 17,000 persons (comprising men and women in nearly equal proportions) are recorded in Sidgwick's tables, they carry considerable weight. It was found that 656 (or 7.8 per cent) of the men and 1033 (or 12.0 per cent) of the women affirmed that they had at some time experienced a hallucination. It is probable that this proportion approximates to the facts; at the same time it is possible that women are more easily persuaded than men that they have experienced a hallucination, and also that women are more ready to confess to such an experience. Some deduction may perhaps have to be made on this account from the feminine percentage, but a greater liability to hallucination in women is in harmony with the greater prevalence of other allied phenomena. A classification of the answers according to the competence of the collectors strengthens rather than weakens the preponderance of women, for if we separate 1649 answers which were obtained by scientific inquirers only, psychologists or medical men, we find that the percentage of women is nearly double that of the men — i.e., 9.0 per cent men against 17.1 per cent women.

[1] Parish in his acute and elaborate study, *Hallucinations and Illusions*, showed that these phenomena tend to appear on the borderland of sleep.

[2] See, for instance, Lombroso, *Man of Genius*, 56, 57.

[3] 'Report on the Census of Hallucinations,' *Proc. Soc. Psych. Research*, Aug., 1894.

It may be added that the persons investigated were chiefly English, or at least English-speaking, but there were a certain proportion of others, more especially nearly 600 Russians and 200 Brazilians, and the differences according to nationality were considerable. Thus, if we take the English-speaking alone, we find that 7.3 per cent men and 11.4 per cent women give affirmative answers. If we take the Russians, we find that 10.2 per cent men and 21.4 per cent women give affirmative answers. And if we take the Brazilians, we find that 23.0 per cent men and 27.7 per cent women give affirmative answers. Hallucinations, therefore, taking these three nationalities, appear to be least prevalent among the English, most prevalent among the Brazilians; while the Russians show the maximum, and the Brazilians the minimum sexual difference.

THE ACTION OF ANÆSTHETICS

The physiology of anæsthesia, as produced by chloroform, nitrous oxide, and other anæsthetics, is not yet fully understood. Nitrous oxide is the anæsthetic that is probably best known, and what is here said will chiefly apply to that anæsthetic. In both the brain and spinal cord there appears to be first a period of excitement, with increased pulsation of blood-vessels; then a period of disordered action; and finally a period of sedative action. The highest centres are most rapidly lulled; in the lower centres there is a greater tendency to excited action. The spinal centres are liberated, perhaps stimulated. There is usually dilation of the pupils, which indicates either paralysis of the higher or stimulation of the lower centres; and this dilatation, especially in the anæmic or hysterical, may be considerable even at an early stage of anæsthesia.

Such being the influence of anæsthesia on the nervous system, it is easy to observe its intimate connection with the phenomena we are here concerned with. If the administration of nitrous oxide for dental purposes were

carefully observed and recorded on a large scale, we should possess a valuable and exact key for the study of many important sexual nervous differences, for during the evolution of the anæsthetic process we have the secret mechanism that underlies psychic action laid bare in an objective manner which we can never expect to see during the subject's conscious life.

It is usually considered that women yield rapidly to the influence of anæsthetics generally; pregnant women take them well; and although they yield so rapidly, there is no reason to suppose that women are more exposed to danger from anæsthesia; it seems more probable that they are less exposed. Children also fall rapidly and deeply under chloroform and other anæsthetics; but they bear them well and recover with equal facility.

We have seen that the effect of an anæsthetic such as nitrous oxide is practically to lull the higher nervous centres and to give the lower nervous centres the opportunity of indulging in an orgy. Is it the nervous system of men or of women that most readily takes advantage of this opportunity?

It has frequently been noted, as a general observation, that various phenomena which may occur during anæsthesia are more common in women. Thus chloroform, ether, nitrous oxide, cocaine, and possibly other anæsthetics, possess the property of exciting the sexual emotions. Women are especially liable to these erotic hallucinations during anæsthesia, and it has sometimes been almost impossible to convince them that their subjective sensations have had no objective cause.[1] Those who have to administer anæsthetics are well aware of the risks they may thus incur. It has also been noted (as by Perrin) that women are more liable to dream under anæsthesia. General muscular excitement, both in the earlier and in the later stages of nitrous oxide anæsthesia, has been observed

[1] See, for instance, D. Buxton, *Anæsthetics*, 204. Silk remarks that sexual emotions during anæsthesia are 'rarely observable in men.'

to be more common in women. Among girls and women, especially if of hysterical temperament, Silk remarks that during the usually quiet early stage of anæsthesia 'every variety of antic may at times be indulged in, of which singing and kicking are the most common'; while just as they are passing fully under the influence of the gas, girls who have hitherto been quiet may begin to scream and kick in a manner that is usually entirely reflex and automatic; 'during the stage of recovery, too, the period of excitement is often very marked, especially in females. Hallucinations with a desire to go somewhere or do something are very common; there may be also more or less violent screaming, beating of the feet, jactitations, etc., followed by hysterical crying.' [1]

Definite figures are of much greater value than general observations, and these on the whole fully confirm the general impressions already recorded. To Silk we owe a valuable contribution to the precise knowledge of sexual differences as revealed by anæsthetics.[2] Of his 1000 cases, 240 were in men, 760 were in women; the average age in each sex was 24 years. It is the tendency to muscular movement which may be most easily observed. Rhythmic movements, such as swinging the legs, beating time to music with the hands, etc., were observed 27 times (2.5 per cent male cases, 2.8 per cent female cases). The excess of females is here scarcely perceptible; it is more marked in regard to rigid muscular contractions; they were noted in only 7.1 per cent males, but in 11.7 per cent females. Erotic symptoms were found by Silk to have undoubtedly occurred in six cases out of the whole series, and always in women, with one exception in young unmarried women under the age of 24. Involuntary micturition occurred ten times, invariably in females; twice in children under

[1] J. F. W. Silk, *Manual of Nit. Ox. Anæsthesia.*

[2] J. F. W. Silk, 'An Analysis of a Series of 1000 Nitrous Oxide Administrations Recorded Systematically,' *Trans. Odontological Soc.*, June, 1890. I am indebted to Dr. Silk for further elucidations regarding several points, and also for additional figures.

14 (which was, relatively, a large proportion, i.e., 20 per cent), the remainder in women between that age and 40.

I take these results chiefly from the published paper already mentioned, but later Dr. Silk was good enough to place in my hands the general results of a much larger number of cases — not less than 5119, of whom 1719 were males, 3400 females; 889 were children under the age of 15. The anæsthetic used was chiefly, although not exclusively, nitrous oxide. The results of this larger investigation confirm, while at the same time to some extent modifying, the results founded on the smaller number of observations. It was found that there was a decided excess of vomiting among males; defecation and rhythmic movements were about equal in the two sexes; in all other respects females were in a majority, and usually in a very large majority. Erotic phenomena occurred 18 times, but only once in a man; to preserve the male ratio they should only have occurred twice among the women. Micturition occurred 23 times in women, instead of 8 times, which would have been in the same proportion as among the males, in whom it occurred only 4 times. If we separate the children (under 15) from the adults, we find that rhythmic movements occur almost exclusively in adults; intestinal rumbling occurs almost exclusively in adult women. Of the 4 male cases of micturition only one was in an adult, but of the 23 female cases 16 were in adults; the erotic phenomena were exclusively in adults.

The evidence furnished by the human organism under the influence of anæsthetics, which abolish conscious and voluntary action, is peculiarly reliable, and the figures here given, which include a sufficient number of cases to ensure trustworthy results, all point more or less plainly to a greater frequency of these manifestations in women than in men; the lower nervous centres in women are more rebellious to control than those of men, and more readily brought into action.

METEOROLOGIC SENSIBILITY

This is not, strictly speaking, a form of sensibility at all, and it has no connection with any of the sense-organs. It is really a form of what we shall later on be concerned with as 'affectability,' and is therefore allied to emotional states but it may perhaps be fairly considered here.

Atmospheric changes are announced, some time in advance, by modifications of the electric, barometric, thermic, hygrometric, and possibly magnetic conditions, and by a number of other physical changes, to which, for the most part, civilised people have become insensitive.

Animals, however, of all kinds — sheep, pigs, fish, ducks, grouse, etc. — can perceive these changes, and respond to what they foretell. It has indeed been said by an acute observer of animal life that 'there are few animals which do not afford timely and sure prognostications of changes in the weather.' [1]

In man, although the meteorologic sense, as Beaunis calls it, is not universal, it is by no means uncommon to find individuals who are sensitive to the approach of atmospheric disturbances, more especially to storms. This sensibility may be exhibited by varying signs — heaviness of the head, general discomfort, a sense of oppression, vague pains, etc. Thus a snowstorm may be preceded by gastric disturbances, nervous irritability, mental and general depression a day or two in advance; and rheumatic subjects often experience pains in their bones with barometric certainty. Beaunis states (as also Gavarret had previously stated) that such sensibility is more common in women and in children, and anyone whose attention has been called to this point will probably have observed the greater frequency of meteorologic sensibility in women. The best subjects are of nervous or neurotic temperament. Kurella, in Germany, noted that a condition of depression in anti-cyclonic weather before the arrival of a storm is six

[1] St. John, *Wild Sports of the Highlands*, chap. XXXIII.

times more common in females than in males, and in adult men he had not observed it at all; he finds a liability to such conditions especially common in telephone girls.

Meteorologic sensibility has been carefully studied by E. G. Dexter on the basis of a large amount of data obtained from schools, police and prison records, etc.[1] He finds that such sensibility is in many respects more marked in children than in adults, and that at school boys seem to be more susceptible than girls; this was indicated both by the actual curves of data, so far at least as heat, cold, and wind are concerned, and by the opinions of the teachers. It is suggested that this may be due to the fact that the boys are often under less disciplinary control than the girls, and one teacher remarks that the girls are greater adepts both at restraining and at concealing their impulses to mischief. Among adults, however, the same tendency is not seen. Dexter found that wherever there was any clear sexual distinction it was in the direction of a greater meteorological sensibility on the part of the women. This accorded with the experience of several principals of schools accustomed to deal with teachers of both sexes. The sexual distinction was very marked in regard to the New York police records for assault. Hot weather increases the pugnacity of women to a much greater extent than that of men. Starting at the lower temperature with a deficiency much greater than that for males, the curve indicates a somewhat gradual increase to an excess of 100 per cent, or double the expected number, for the temperature groups 80° to 85°, at which point it makes a drop to 33 per cent (due to the exhausting and devitalising influence of great heat). The curve for males shows neither extreme so far from the expected result, nor is the drop at the end so marked.

Sensibility to the influence of seasonal changes is shown in marked manner by the prevalence of insanity and sui-

[1] Dexter, *Conduct and the Weather*, Monograph Supplement, *Psych. Rev.*, no. 10 (1899); *ibid.*, *Pop. Sci. Monthly*, April, 1902.

cide during the spring and summer months.[1] Suicide by no means necessarily implies insanity; it involves, however, a similar condition of mental instability, and it is largely subject to the same cosmic laws.

Morselli, in his monograph on 'Suicide,' noted in women the quicker development of suicidal tendency during the summer season or the first warmth of spring. 'The greater proportion of suicides among women,' he remarks, 'is manifest, whether during the whole season (Italy, Prussia, and Saxony) or in the warmest months of June (France) or July (Bavaria). In Italy and Saxony alike he noted the prevalence of suicides among women in the months of April and May, while the proportion offered by women in certain warm months (as July in Bavaria) largely exceeded the highest monthly average of men.' Morselli also found from the data he collected that among women violent deaths through madness are proportionately more numerous in April, when the first heat, though not intense, is felt exceedingly by the cerebral organism not yet accustomed to it, and in July, when the average monthly temperature reaches the maximum of the year.

It must be added that some slight examination of the suicide rates that I have been able to make, considering them not by month but by season, does not altogether confirm Morselli's conclusions. In Saxony, for example, during the years 1876–79, I find that while 28.5 of the total male suicides took place in the spring, only 26.1 of the female suicides were committed during that season. And if we group together the Teutonic and Scandinavian countries — Prussia, Saxony, Denmark, Norway, Sweden — it will be found that out of a total of nearly 19,000 male suicides 28.3 per cent occurred in spring, and out of a total of nearly 5000 female suicides 28.2 occurred in spring; while 30.3 per cent of the male suicides and 29.3 per cent

[1] Durkheim in his sociological study, *Le Suicide* (1897), chap. III, regarded these seasonal phenomena as really social, and due to the greater length of the day in summer.

of the female suicides were committed in summer; 22.5 per cent male suicides and 23.6 per cent female suicides were committed in autumn, and precisely the same percentage of 18.9 male and female suicides took place during the winter. This shows no marked sexual difference, and the preponderance of women in the autumn is almost exactly balanced by the preponderance of men in the summer. Morselli's conclusions cannot be accepted unreservedly without further investigation.

As to the varying incidence of insanity, month by month, in the two sexes, I do not possess much evidence. So far as I am aware, the question of any sexual difference in this respect has not been raised. Figures of admissions to asylums in France, supplied by Parchappe to Bucknill and Tuke, seemed to show that men were more affected by season than women. The result is different, however, if we turn to the much larger figures (nearly 40,000) supplied by Scotch asylums during eighteen years.[1] Per 1000 men during the years 1865–74 the excess of admissions during the spring and summer over the autumn and winter was 54, and during the years 1880–87 it was 58. For women during the first period the excess in spring and summer over autumn and winter was 66, and during the second period, 76. During the three spring months the proportion of male insane admitted was 27.1 per cent, that of females 27.5 per cent. Or, expressed in another way, while in the months of January during these years the admissions of men and women were nearly equal, in May there was a large excess of women. The greater sensitiveness of women to this seasonal influence is therefore in Scotland fairly constant and well marked. In New York Dexter has found that the yearly curve of the incidence of insanity is more marked in females (though his numbers are hardly sufficiently large); a chief climax in May and minor climaxes in March and September were all more marked in females.

[1] Reports of Board of Commissioners in Lunacy, Scotland, Seventeenth Report, 26, and Thirty-First Report, 28. Quoted, with many observations on the physiological influence of season, in Leffingwell's *Influence of Seasons upon Conduct* (1892), 101, 157.

HYSTERIA AND OTHER NERVOUS TROUBLES

Psychic and nervous troubles, generally regarded as 'functional,' are extremely common in civilisation. They are often found in highly cultured persons, sometimes of great intellectual ability. It is recognised, moreover, that they occur more often in women than in men.

On account of the variety of such disorders, their multiform vague shape, and the difference of opinion in regard to them, it seems unprofitable to consider their exact sexual incidence. But the greater prevalence of most of them among women is generally clear when they can be considered precisely. This is for instance the case as regards obsessions, including such morbid dreads as agoraphobia or the fear of open spaces, claustrophobia or the fear of enclosed spaces, anthropophobia or the fear of being with others, rupophobia or the fear of being dirty, nyctophobia or the fear of night, and a vast number of other fears to which it is not worth while to give names.[1] Obsessions, while by no means rare in men, are more common in women; Pitres and Régis found 154 cases in women to 96 in men; these ideas have been studied in women with great care by Janet. In the simplest and most elementary form such fears may be called natural; in their most pronounced form, and carried beyond all control of reason, they belong to the domain of insanity; in neurasthenia we have them in an intermediate stage.

Neurasthenia may be regarded as a general condition of agitation of the nervous system, and it is not surprising that we find it in both men and women who overstrain their brains, in artists and writers and those who are overstrenuous in social movements. Hysteria, which is a more definite disease though usually coupled with neurasthenia, has no necessary connection with mental tension. It occurs with greater frequency among those whose nervous activities are unemployed.

[1] A vivid literary picture of such morbid obsession is to be found in a chapter of Borrow's 'Lavengro'; it is undoubtedly taken from life.

Although one of the greatest of the old English physicians, Sydenham, laid our knowledge of hysteria on a sound and scientific basis, the word has too often been used in a loose and inaccurate sense, or even as a mere term of abuse, and it is only within recent years that it has been more rigidly defined and its nature more precisely investigated in detail. This advance is largely owing to the initiative of Charcot who demonstrated that hysteria is a definite disease with a traceable physical mechanism. He insisted on its hereditary character, but this and some other of his conclusions have been modified by later investigations, notably by those of Freud whose psycho-analytic work began with the study of hysteria.[1]

Hysteria is a disease which affects the whole nervous system, and more especially the brain; it is, as Charcot taught and is now usually agreed, essentially a psychic disease. Response to suggestion is a fundamental normal character of all nervous tissue. Even among bees it is said that when a band of brigand bees enter a strange hive to despoil it of honey, the owners of the hive are themselves sometimes so carried away by the contagion of rapine that they will even go over to the robbers' side and assist in destroying the result of their own labours. The same irrational suggestibility is found among healthy human beings, at all events in an incipient state. An English prison matron confessed that sometimes when she heard the women under her care 'break out' (as it is called) and commence smashing and destroying everything they could get hold of, it was as much as she could do to restrain herself from joining in; and many persons have experienced a similar impulse. In hysteria this tendency is so heightened that it becomes irresistible, and may be aroused by the faintest suggestion from without, and also from within. Thus there is what Huchard, who belongs to a somewhat older school,

[1] For a summary of Charcot's view on hysteria, see Gilles de la Tourette, *Traité clinique et thérapeutique de l'hystérie, d'après l'enseignement de la Salpêtrière* (Paris, 1891). For Freud's doctrine, see many passages in the four volumes of Freud's *Collected Papers* and also in his *Lectures on Psychoanalysis*.

calls moral ataxy. And Féré, in allusion to this almost uncontrollable response to stimuli, has called the hysterical subject 'the frog of psychology.' In hysteria, however, there is much more than an undue reaction to stimuli; reaction is, indeed, in some respects, abnormally defective. Sollier, in an elaborate work on hysteria, interestingly regarded it as a state of incomplete sleep. There is a narrowing of consciousness, a narrowing which, on the sensory side, may be precisely measured, and is marked not only by anæsthesia but by loss of memory and of will. There is also, probably, as Freud has specially insisted, an increase of unconscious psychic activity, by a process of suppression, at the expense of conscious activity, in intimate relation to the sexual sphere.

This mental mobility, emotional facility, and uncontrollable response to stimuli have frequently led to charges of wanton deception and stimulation against the hysterical. Such charges are quite unfounded. 'The real deceiver,' as Gilles de la Tourette well remarks, 'is an active and reasoning being; the hysterical, when they deceive, are not conscious of the deception; they are passive beings, photographic plates which register and show forth their impressions as they have received them, sometimes amplified, indeed, but always with the good faith of unconsciousness.'

Clouston nearly fifty years ago defined hysteria as 'the loss of the inhibitory influence exercised on the reproductive and sexual instincts of women by the higher mental and moral functions.' This loss of the control exercised by the higher centres was seen to be undoubtedly an essential character of hysteria, but it was not usually accepted that there was necessarily any sexual element in hysteria. Formerly the sexual element in hysteria had been exaggerated; this led to a reactionary tendency to unduly minimise it, and more lately, under the influence of the Freudian psycho-analytic school, the sexual origin of hysteria has again been magnified. Sexual irritation in

any crude form, or any gross disease of the sexual organs, is certainly not essential in hysteria, but many of the symptoms of hysteria can be traced back to a sexual origin. It is noteworthy also that, as Lombroso pointed out, the criminal offences of the hysterical largely revolve round the sexual functions. There is often some perversion of emotion, so that, though the hysterical may crave for love and tenderness from the opposite sex, normal sexual relations may be indifferent or repulsive. Both among the 'possessed' of former days and in modern times it has been noted that erotic dreams are frequent in the hysterical, but that they are often painful rather than pleasurable. The mistake of supposing that there is some special connection between hysteria and the sexual organs probably arose from the undoubted fact that in women the organic sexual sphere is of greater extent than in men. When, therefore, the higher controlling centres are to some extent paralysed we must expect to find all sorts of phenomena traceable to a sexual origin more prominent in women. It is not so in hysteria only, but in nearly all varieties of nervous and mental disorder.

To some extent the manifestations of hysteria are subject to influences of the environment and to the spiritual fashions of the age. We have not said everything about it when we begin and end the causation, as Charcot was inclined to do, with heredity, although in the majority of cases hysteria is rooted in a definite neuropathic hereditary soil. There is sometimes a tendency to emphasise unduly the external influences and to minimise the organic tendencies. Reference may be made to one curious impulse occasionally found in young girls in our own civilisation which is generally regarded as hysterical. It is the tendency to devise secretly mischievous and sometimes disgusting tricks in the domestic sphere so difficult to find out that they apparently seem of 'supernatural' origin. These seemingly unaccountable phenomena have been in England carefully investigated by the Psychical Research

Society and after considerable trouble the culprits have usually been found to be young girls.

Yet exactly the same phenomena are witnessed in Indian homes and attributable to young women who can know nothing of the hysterical manifestations of their European sisters. A detailed account of an episode of this kind, said to be well recognised as apt to occur in Malabar families of India, has lately been given by Dr. Krishna Ayyar of Calicut. Human excretions were found lying about outside the kitchen door, then in the kitchen, on the hearth, even in the food. The hand of Chathan was unmistakeable, for night soil is his special weapon, and by solemn rites it was sought to exorcise him. But 'for the space of two months the family was subjected to the most harassing torment that human mind could conceive of.' Jackets and petticoats were set on fire. Pictures and mirrors fell from their pegs. Pottery was flung across the room, though never when anyone was present. Things were removed from locked cupboards and trunks. So strong was the belief of the people in the supernatural source of these happenings that no careful attempts were made to investigate them. But Mr. Krishna Ayyar, though he clearly had no knowledge that similar phenomena are recognised in Europe, suggests the right explanation. 'It is quite probable,' he says, 'that Chathan may, on a fuller and more careful investigation, be found to be some inmate of the house suffering from a nervous affection which does not paralyse but only perverts the senses and which makes the patient feel delighted in handling things one normally detests and abhors.' He adds that 'probably women are more liable to this disorder than men, for it is only one who moves freely in the kitchen that can easily and without being noticed defile drinking water and the well-cooked food.' [1]

[1] K. V. Krishna Ayyar, M.A., 'Chathan: A Devil or Disease?' *Man*, Sept., 1928. Chathan is in South Indian demonology the imp of mischief. It is, however, a plausible view that in such cases as these, alike in Europe and India, it is the elders alone who are 'hysterical,' not the impish children who play on their credulity.

Hysteria, we see, is by no means the result of civilisation or of our own special social or sexual order. It is even more prevalent in savagery than in civilisation, and again predominantly among women. This is notably so among the tribes of northern Siberia, where indeed hysteria (here called 'arctic hysteria,' in which various complaints are included but mainly ordinary hysteria) is said to be more common than in any other part of the world, and it is women who are specially prone to it.[1] Up till recent times it was always supposed that hysteria is enormously more frequent in women than in men. Sydenham recognised hysteria in men, especially among those of studious and sedentary habits (no doubt including what we should now call neurasthenia), but hysteria in the male was always regarded as a rarity. Briquet, the chief authority on hysteria during the middle of the last century, found one man to twenty women. But Pitres at Bordeaux finds one man to two women, and at Paris Gilles de la Tourette found that among Charcot's cases there was also one man to two women. During the Great War hysteria was frequently found in men. It is no longer possible, therefore, to assert that hysteria in men is rare. At the same time there is excellent reason for believing that it is scarcely so frequent as these statistics would lead us to think. It is generally agreed that hysteria in men usually occurs among the poor and ill-nourished classes who frequent hospitals, while in women it occurs among the idle and well-to-do, whose numbers do not swell hospital statistics. Again, it has been found by Charcot and others that hysteria in the male is a more serious and obstinate affection, while in the female mild cases are much more usually seen; this also tends to vitiate the statistics of the frequency of hysteria according to sex, as it is only the serious cases which prominently attract medical attention. We may safely conclude that while hysteria is more frequent in men than was once sup-

[1] M. A. Czaplicka, *Aboriginal Siberia* (1914), 307–25. She here gives a full and interesting account of hysteria as found among the uncivilised.

posed, it is much more common in women. Such a conclusion is in harmony with the opinions of the greatest masters in the science of morbid pyschology, from Sydenham, who asserted that there are very few women (except those leading a hard and laborious life) who are entirely exempt from some trace of hysteria, down to Kraepelin, who states that 70 per cent of adult women are hysterical, and Tonnini, in whose vigorous phrase the hysterical person is the colossal image of all that is most peculiarly feminine — *la gigantessa della femminilità.*

Heymans, from the psychological side in his careful and suggestive study 'Die Psychologie der Frauen,' has developed the conception of hysteria as an exaggerated picture of normal feminine characteristics. He especially insists on the narrowing of consciousness. It is a result of this narrower consciousness, Heymans argues, that women's feelings and ideas are often more acute than men's, and less qualified by related circumstances. 'Consciousness in women is higher in degree than in men, but less in extent.' It is thus that, as he found by his *enquête* in Holland, women are both less accessible to new conceptions and more easy to persuade than men; the two apparently contradictory characteristics both being due to a suggestibility — auto-suggestibility and hetero-suggestibility — receptive of a comparatively narrow range of ideas. Thus it is that facts reach consciousness more suddenly in women than in men, and that transitions are more rapid. A man, as Heymans truly remarks, in the course of a long walk will experience the onset of fatigue gradually; a woman will be surprisingly free from any feeling of fatigue until a moment suddenly arrives when she feels that she cannot take another step. This combination of intensity with contraction of consciousness in women is associated with greater emotionality, and a liability in speech and action to be predominantly affected by the influences of the moment. In association with their narrower but more intense consciousness, Heymans also found

that women are more affected by grief than are men, and less easily consoled.

When hysteria is regarded as an exaggeration of characteristics often found in normal women, reference is frequently made to its manifestations of suggestibility. The suggestibility of hysteria is often auto-suggestibility rather than from without. But the evidence seems to show that women are normally, on the whole, more suggestible than men, though Kossog found that in some respects — as of a sound or odour not really present — they were less suggestible. But it seems doubtful if any sexual difference is well marked in childhood; Cohen and Dieffenbacher found no sex difference in this respect among school children.

While the manifestations of hysteria clearly arise with greater facility on the foundation of the feminine than of the masculine organism, it must not be assumed that they have any close or immediate association with the efflorescence of puberty and the onset of menstruation. It is with the subsequent period of adolescence that they are more closely associated. Briquet in France found that a fifth of the cases of hysteria appeared before the age of puberty (putting that age at 15), that from that period the frequency both of hysterical disposition and hysterical manifestations went on increasing until the age of 20, and after 20 or 25 notably sank; he does not attribute this entirely to sexual causes but to a variety of psychic influences specially bearing on women. According to Batault hysteria appears chiefly between the ages of 10 and 20. Löwenfeld in Germany similarly attaches no special significance to the epoch of puberty. Various other authorities state that between the ages of 12 and 20, or 16 and 20, is the time when hysteria is the most likely to appear.

It will be seen that the consideration of hysteria brings us up to questions we are concerned with under various heads. The texture of hysteria is woven of many threads. There is much interest in considering why the mental

disturbances of psychogenic origin of which it is the type are found with special frequency among women. Putting aside organic constitution, what are the stresses peculiar to women? Dr. Jane Suttie, of Glasgow, in a suggestive paper on this problem,[1] among other factors, attaches importance to differences in the maternal attitude towards son and daughter; 'parents do not value girl children as highly as boys and this is largely due to the maternal attitude,' as the mother's influence in the home is usually predominant over that of the father which might serve to correct it. Hence arise for the girl disparagement, discouragement, jealousy, resentment against masculinity in general, fairy-prince fantasies, etc., combined with a more repressive type of education and culminating in an 'inferiority complex,' more or less masked by a compensatory aggressiveness. A second difference tending to stress, Dr. Suttie believes, is the double demand on girls of an equipment in domestic skill never demanded of a boy combined with the demand on her to prepare for competitive work in the world, while the virtues befitting one of these vocations are not the virtues befitting the other. Yet in that competitive work in the world which only absorbs her on one side she is expected to equal the standard set by men, who are not concerned with any other side, and consequently the strain on her is much greater. If they model themselves entirely on men the inner psychic conflict is likely to be increased, for when the interests of women deviate widely from their biological objective they suffer more than do men, 'probably because women's biological objectives are more intrinsically of the web and woof of their lives.' So that 'women are in some ways overtaxed by our social system to-day.' We cannot suddenly alter that system, but at least we can learn to grasp the problems it brings, and seek rational ways of removing, or at least diminishing, the risks it presents.

[1] J. I. Suttie, 'Mental Stresses of Adjustment in Women,' *Brit. Med. Jour.*, 23 Sept., 1922.

RELIGIOUS PHENOMENA

There is an intimate connection between the phenomena we are here concerned with and the phenomena of religion. The part played by women as religious leaders is by no means so large as the large proportion of women in religious movements would lead us to expect, but it is considerable, and it has been most conspicuously exercised in that part of religion which brings us near to the unconscious. As 'prophetesses,' women, who seem to have fallen into the trance state and seen visions or heard dogmas, which they subsequently declared, have often been of the greatest service to religious leaders, and conspicuously helped to draw disciples by the charm of the supernatural. Apelles, the founder of the Apellæans of the second century, was powerfully assisted by the prophetess Philumene. Montanus, who was himself similarly affected, was closely associated with the prophetesses Priscilla and Maximilla, who were subject to ecstasy, during which they had visions that seem to have influenced Tertullian, one of the greatest of the Latin Fathers. The Quintilians, led by the prophetess Quintilia, were a branch of the Montanists, and their virgins in public assembly wore white robes and exercised prophetic functions; they asserted that women are entitled to exercise all the sacerdotal and episcopal functions. Petersen, a visionary Millennarian of the eighteenth century, was aided by his wife, who was also a visionary, and with them was associated an inspired countess, who was also honoured with visions. It would not be difficult to multiply examples of women who have exhibited such phenomena in a high degree and played an important part in religious movements. A large proportion of the most eminent female saints who led a conventual life were in the highest degree hysterical.

It is in such an environment that one of the most impressive religious manifestations of hysteria occurs, stigmatisation. This has most usually happened to women. Imbert-Gourbayre, in his careful study of this subject,

found that up to 1891 there had been altogether 321 examples of more or less complete stigmatisation, and of these only 41, or almost 13 per cent, were in men.[1] Allied, if non-hysterical, phenomena marked the Shakers who were founded by a man and a woman in conjunction (James Wardley, a Quaker tailor, and his wife), and their most distinguished and successful leader was Anne Lees, of Manchester, who transferred the sect to America, where, under her guidance and by means of her missionary zeal, it grew and flourished. Their religious exercises, we are told, consisted chiefly of '*Shaking* and trembling, singing and dancing, leaping and shouting, and prophesying and speaking with new tongues.' The Theosophists and the Christian Scientists, it is instructive to note, are at once both the only modern religious sects of any importance founded and led by women, and the only modern sects established on 'magical' and esoteric doctrines and practices.

Sometimes similar phenomena, especially those of a contagious character, play so large a part that nearly every intellectual element disappears. Such religious movements, unquestionably morbid in character, are largely and sometimes exclusively manifested in women, and they rarely possess any prominent leader. They are often saltatory in character, and are in some cases varieties of that epidemic nervous disorder called hysterical chorea. The Dancers, a religious sect of the fourteenth century, which arose at Aix-la-Chapelle and spread throughout Belgium, present an example of religious phenomena of this type in which women played a prominent part. The Dancing Mania began immediately after the pagan midsummer orgies of Saint John the Baptist's Day in 1374. Men and women seemed to have lost all self-control. Suddenly, whether in public or private, they would begin dancing, while holding each other's hands, and would continue dancing with extreme violence until

[1] Imbert-Gourbayre, *La Stigmatisation et l'Extase Divine* (1894).

they fell down exhausted; during these periods of muscular agitation they were insensible to outward impressions, and were favoured with wonderful visions.[1] The Camisards, or prophets of the Cevennes, who arose in Dauphiny and Vivarais in the seventeenth century, and among whom, as usual, women were prominent adepts, were subject to ecstasy, and, as they considered it, the inspiration of the Holy Ghost. 'They had strange fits,' we are told, 'which came upon them with tremblings and faintings, as in a swoon, which made them stretch out their arms and legs, and stagger several times before they dropped down. They struck themselves with their hands, they fell on their backs, shut their eyes, and heaved their breasts. The symptoms answer exactly to those produced by inspiring nitrous oxide, and were the fact then discovered we should have been tempted to suspect imposture. They remained a while in trances, and coming out of them declared that they saw the heavens open, the angels, paradise, and hell.'[2] This is an admirable picture of a religious orgy of the unconscious activities of the human organism.

In the convulsive religious epidemic of Redruth in Cornwall, at the beginning of the past century, which spread with extreme rapidity over a considerable region from Helston to Camborne, and which was marked by uncontrollable movements of all parts of the body, no age or sex was exempt, but girls and women were the most frequent victims. The religious nervous affection of the Shetland Islands, which belongs to about the same period, was almost identical in character, and almost exclusively affected young women.[3]

At Morzine, a little village in the Haute-Savoie, during 1861–65, there was a religious epidemic in which gentle

[1] Hecker, *Epidemics of the Middle Ages*, 'The Dancing Mania,' chap. I.

[2] *A Dictionary of All Religions*, Art. 'Camisars,' in which references are given to original authorities.

[3] Hecker, *Epidemics*, 'The Dancing Mania,' chap. IV, and Appendix V. The hysterical phenomena witnessed during the great religious revival of 1859 in Ireland were studied in a pamphlet of great interest by Archdeacon Stopford, 'The Work and the Counterwork' (Dublin, 1859).

young girls during the paroxysm replied judiciously to questions in various languages, uttered abominable blasphemies, were subject to hallucinations, climbed trees with marvellous agility, and gave forth prophecies which were sometimes realised. They knew nothing afterwards of what had gone on. The epidemic seems to have been confined to young girls, and the population generally regarded the phenomenon as supernatural. The ecclesiastical authorities attempted exorcism in vain, but the civil authorities, with a brigade of gendarmerie and isolation of the affected individuals, were more successful. A somewhat similar outbreak also took place some years ago at Verzegnis, a mountain village in Friuli, after a mission preached by a Jesuit father among a superstitious population predisposed to hysteria. The phenomena were those of profound hysteria of demoniac form, chiefly or exclusively in women, and they were dissipated with great difficulty by somewhat the same means as those adopted at Morzine. Half a century ago the little town of Alia, near Palermo, became famous on account of the religious enthusiasm of its female inhabitants; insanity, epilepsy, and hysteria abounded, and the town fell into great moral and physical misery.[1]

In Russia during the past century a number of religious sects were founded, or have developed, which practise dancing, leaping, flagellation, even castration, although some of them have been at the same time of a practical and rationalistic character. In all these sects women play a prominent part; in some the majority of the members are women; a few have been founded by women. It is not surprising that in these Russian sects women enjoy a position of freedom equal to that of the men. The sect of Christs (or Khlysts) believe that every person contains, or may contain, a portion of the divinity, and is worthy of adoration. Amid dancing and sobbing, the Holy Spirit descends. It is a wild and giddy dance which begins at midnight, after long hours of prayers and psalm-singing

[1] 'La Psychopathie religieuse d'Alia,' *L'Encéphale* (1881).

and religious discussion. Then the Christs, both men and women, remove all their garments and put on long white shirts and white cotton stockings. Candles are lighted, and after singing a monotonous chant a few begin to leap and to dance. Gradually the others join, and they beat time with their feet, the men in the direction of the sun, and the women in the opposite direction. Their movements increase in rapidity, and their sobs become more violent. Each Christ begins to revolve, the men to the right, the women to the left, with such rapidity that the face cannot be distinguished. They leap, they contort themselves, they run after each other, they flagellate each other. In the midst of mad laughter, of cries and sobs, loud shouts are heard: 'It is coming! It is coming! The Holy Spirit is coming!' Then the excitement of this strange *danse macabre* of shouting, half-naked, white-garmented figures — which produces a tremendous effect on the novice — begins to culminate. Men and women tear off their garments, go about on all fours, ride on one another's backs, and give way to the sexual erethism which had been exalted to the highest point. The Christs reject marriage, and generally practise asceticism, but at such moments they are carried beyond themselves, and they feel that the physical emotions they experience are sanctified. There are a great many women among the Christs; and women among them enjoy great honour, as well as equal rights with men. At their religious ceremonies some strong, beautiful, and intelligent young woman is often chosen for special adoration as the personification of divinity and the emblem of generative force; they call her the Virgin Mary, and they identify her with the Earth Goddess. She is their priestess; they prostrate themselves before her; she bears on her head a sacramental plate of grapes, and solemnly distributes them to the worshippers. Among the Skoptsy, a sect related to the Christs, the same observances and the same worship of women are carried to a still higher point; the castration or mutilation of both men and women is

practised in their rites; they sometimes worship a naked young girl, cover her with kisses, and when she has reached the necessary pitch of reckless exaltation she allows them to communicate in her blood. It has sometimes been found among groups of Skoptsy that more than half the members are women.[1]

Religious movements of this epidemic character find their chief adepts among persons in whom the inhibiting influences of the higher intellectual centres are in but a lowly stage of development. The comparatively rare cases in which individuals of more than average mental culture are attracted in any number to a religious movement of this kind seem to belong to periods of over-strenuous intellectuality, during which a number of individuals are forced to adopt a rationalistic asceticism for which they are unfitted; at last the rationalistic fetters fall off, and the suppressed hypnotic centres explode with immense satisfaction. This is an important key to the psychology of 'conversion.'

It is natural that we should find such phenomena highly developed among primitive races, and here they are peculiarly apt to be marked by suggestibility. A remarkable form of hysteria, really propagated by imitation, is the *latah* found among the inhabitants of the Malay Peninsula, Java, Sumatra and the neighbouring islands. It chiefly occurs among the women, both of higher and lower social rank, and in a minor degree is very common among them, especially after middle age. Latah assumes many forms, but in most of them, as in the Tarantism of the Middle Ages, and indeed in nearly all such manifestations, there is an irresistible tendency to imitation, a boundless suggestibility and especially echolalia. The case is mentioned of a woman who appeared to be quite normal, but on any one

[1] These and other semi-Christian mystical and rationalistic sects are described by N. Tsakni, *La Russie Sectaire* (1888). The Christs or Khlysts have been studied by Paul Jacoby of Orel (*Arch. d'Anth. Crim.*, 15 Dec., 1903); he finds that their leaders are often hysterical or insane, and that their practices resemble those of Finnish shamanism.

throwing off a coat in her presence she would suddenly pass into a state of frenzy, strip herself of her clothes, and conduct herself in other indecent ways, whilst all the time she kept abusing the instigator of what she regarded as an outrage.

In other respects the subjects of latah are mentally quite sound, and may even be above the average in intelligence and of marked personality. Like other similar affections it is somewhat contagious even to strangers living in this region, while it is not found among Malays living abroad. The Malays themselves regard it not as a disease but as a personal peculiarity, which it is not polite to notice, except they wish to tease and torment.

It is impossible here to deal with the subject of religious psychology; but it will probably be obvious that all the various forms and stages of the phenomena we are here concerned with go to make up religious exaltation in its most characteristic forms. This fact is patent even to the devout historian of the Camisards, who, as we have seen, is struck by the close resemblance between the religious phenomena presented by that sect and the phenomena of anæsthesia by nitrous oxide, the lowest and least intellectual of hypnotic states. The general characteristic of all these manifestations may be expressed by saying that there is lessened control by the higher intellectual centres and increased activity of the more spontaneous and automatic motor and visceral centres. Or, if we prefer, we may say that the more highly coördinated action of the nerve centres gives way to their more incoördinated action, and therefore the presence of these phenomena indicates a lower degree of mental integration.[1] In catalepsy and anæsthesia there may be complete quiescence of the higher modes of action; in dreaming, ecstasy, and hypnotism proper, they are taken into comparatively uncontrolled

[1] 'As we ascend the animal scale,' Ferrier remarks in his *Functions of the Brain*, 'the centres of which the cerebro-spinal system is composed become more and more intimately bound up and associated with each other in action.'

spheres; in hallucinations they remain in the normal sphere, but are perverted; in neurasthenia and hysteria there is merely a slightly lessened control of the higher centres; while the increased activity of the lower centres may be intertwined with a considerable degree of intellectual activity in the modes of religious exaltation.

It is not necessary here to discuss the causation of hypnotic religious phenomena. To do so would be to open up many interesting questions which are still scarcely ripe for solution. Tylor [1] briefly discussed the evolution of these religious phenomena, from the earliest savage times to the revivals of the present day. He insists on the importance of fasting in their development: 'Bread and meat would have robbed the ascetic of many an angel's visit; the opening of the refectory door must many a time have closed the gates of heaven to his gaze.' The importance of fasting in the evolution of visions is certainly great. It must be added that sexual abstinence has played a prominent part in producing the more typical motor phenomena. Continence is enjoined on the adepts of nearly all religions. It is only among a few sects, and at the climax of religious excitement, that the sexual emotion has been regarded as sanctified. Its repression has usually been necessary to assist in elaborating the process of religious auto-intoxication. But the final explosion of the suppressed sexual instincts is often violent. Having been, as it were, diverted into a foreign channel, and their impetuosity at the same time increased, they finally break violently back into their normal channels. Anstie, an acute observer of some of the intimate details of the emotional life, long ago remarked in his 'Lectures on Diseases of the Nervous System,' 'I know no fact in pathology more striking and even terrifying than the way in which the phenomena of the ecstatic state — which have often been seized upon by sentimental theorisers as proofs of spiritual exaltation — may be plainly seen to bridge the gulf between the innocent fooleries of ordinary

[1] *Primitive Culture*, 3d edit., 1891, II, 128–42, and 410–21.

CURVES SHOWING THE FREQUENCY OF CONVERSIONS IN VARIOUS YEARS (*Starbuck.*)

—— = Males --- = Females

hypnotic patients and the degraded and repulsive phenomena of nymphomania and satyriasis.' At the time when Anstie wrote the connection between spiritual exaltation and organic conditions was not so plain as it is at present, but he had clearly perceived the especial facility with which the ecstatic condition passes over into disordered sexual emotion. Since then the almost constant connection between ecstasy and sexual excitement has become fairly well recognised.[1] The phenomena of the religious life generally are to a large extent based on the sexual life, and the majority of conversions (about 80 per cent) take place during adolescence.[2] Starbuck found that conversion tends to occur within a year after the establishment of puberty; the average age of puberty being reckoned as 13.8 years for girls and 15.6 for boys; the average age for conversion was 14.8 for girls and 16.4 for boys. Ruediger, again, found that the average age of conversion in men is 16 years, with a median of 15, and the average age of conversion in women is 14.8 years, with a median of 14.

It must be remembered that these phenomena are strictly physiological, although they are liable to be increased or modified to a degree that is distinctly morbid; an individual in whom the action of the higher centres had largely abolished the stirrings of the lower centres would be morbid to a still greater degree. As here understood, they lie at the physiological basis of what we more generally call 'emotion.' When, therefore, we conclude that women are more liable than men to present hypnotic phenomena, we have but discovered in a more definite and fundamental manner that women are more 'emotional' than men. We have now to define more precisely what is meant by the 'emotionality' of women.

[1] See, for instance, Havelock Ellis, *Studies in the Psychology of Sex*, I, Appendix C, and J. H. Leuba, *The Psychology of Religious Mysticism* (1925), 137–53.

[2] See a suggestive paper by A. H. Daniels, B.D., 'The New Life: A Study of Regeneration,' *Am. Jour. Psych.* (1893), VI, no. 1; and Starbuck, *The Psychology of Religion*, as also William James's wider-ranging work, *The Varieties of Religious Experience*.

CHAPTER XII

THE AFFECTIBILITY OF WOMEN

What is an emotion? — Readier response of the vaso-motor vascular system in women — Physiological and pathological evidence — The heart — The convulsive tendency of women — Epilepsy — Blushing — The reflexes — Ticklishness — Laughter and tears — Facial expression — The iris — The bladder — Susceptibility to fright — Mental suggestibility — Obsessions — Emotional causation of disease predominates in women — Destructive tendencies — 'Breakings out' — The source of these — The congenital exhaustibility of women — The advantages of women's affectibility — Anæmia and affectibility — The greater affectibility of women to some extent the result of circumstances, to some extent organic.

Women respond to stimuli, psychic or physical, more readily than men. This general statement, though it may be modified or limited in certain respects, is uncontested. By what word we may best describe this characteristic of women's nervous constitution is less clear. We may call it with perfect correctness a greater 'irritability' or 'plasticity,' or 'suggestibility.' All these terms are legitimate, but on the whole I prefer to use an old word, approved by Laycock [1] — sufficiently colourless to be unobjectionable, while it indicates both the quick psychic and the quick physical response to stimuli — and to speak of the greater 'affectibility' of women. Affectibility is thus a synonym of that capability for responding to stimuli which is an essential characteristic of living beings, except possibly those of the very lowest order.

In considering the influence of the unconscious — the tendency, that is, of the more primitive nervous centres to be stronger than the more recent centres, and to rise up in revolt against them — we were approaching on its most obscure side the greater emotionality of women. We now approach it from a somewhat less obscure side.

What is an emotion? We shall more easily gather the drift of the facts if we understand this at the outset. It was

[1] Laycock, *Nervous Diseases of Women*, 76.

formerly supposed, and is no doubt still supposed by many people, that an emotion is a purely mental phenomenon, and that anger or love may go on in the brain somewhat in the same way as an arithmetical calculation. This is not the case. If it were found by the application of delicate physiological tests that a man's vascular and muscular systems were working at their usual normal tension, it could probably be affirmed that that man was not feeling emotion. No amount of self-control over the coarser expressions of emotion alters the case, for even to unscientific inspection the passion of the self-controlled man reveals itself by some quiver of muscle, some sudden pallor, some quickening of heart-beat. Just as it may be said: no muscle, no motion; so it may equally be said: no muscle, no emotion.[1]

There are very good reasons, which we must realise at the outset, why women should be more 'affectible' in the sense here understood than men. These are rooted in the special endocrine constitution of women and in the periodic reproductive cycle with its constant changes in physiological balance. As Bucura was one of the first to point out, the greater emotionality of women, into which psychic sexual differences may be largely resolved, has its source in the special disposition in women of the endocrine glands.[2] Head, moreover, has observed how the general bodily state at the menstrual period, with its then widespread fluctuation in subjects temperamentally predisposed, forms a potent cause of diminished automatic control by the central nervous system. Potentially painful

[1] Bocalosi, an Italian writer of the eighteenth century, in his book *Della Fisionomia*, seems to have had a glimmering of the truth that emotion depends on physical organisation. Precise investigation was initiated by Angelo Mosso, of Turin, who showed, by means of instruments, such as the plethysmograph and the balance he had himself devised, that the whole organism responds at every psychic or physical stimulus, at a word or at a touch, forming a kind of sounding-board, against which every change in consciousness at once reverberates. The slight changes never reach consciousness again, but at a certain threshold of intensity they return to consciousness, and emotion is attained.

[2] Bucura, *Geschlechtsunterschiede beim Menschen* (1913), 83.

impulses, which would normally be inhibited or locally confined, tend to spread widely and are apt to react vividly to any excitation capable of evoking discomfort.[1] Associated with this nervous source of emotionality, and underlying it on the hormonic side, is the variability in ovarian and thyroid secretion, with tendency to unusual excretion of lime salts; it is these calcium compounds, it now appears, which are largely responsible for vaso-motor stability and nervous and muscular control. So that excessive secretion of these salts will lessen mental equanimity; mind, body, and the reproductive system being thus all correlated.[2]

The fact that the vaso-motor system — the neuro-muscular ruler of spontaneous organic life — responds more readily to stimulus in women than in men is embodied in the familiar saying that woman's heart is tender. This, as Mosso remarked, is only another way of saying that the nervous mechanism of women's hearts is excited, so causing them to beat more quickly, under the influence of stimuli by which men's hearts in a state of health are unaffected. A proof of the greater excitability of women's hearts is found in the fact, which has been noted by several observers, that there is a distinctly greater increase in the number of pulsations on awaking from sleep in women; the excitement of waking life affects the hearts of women (and also of children) to a greater extent than those of men. Even the complex phenomena of hysteria have been defined by Rosenthal as ultimately resolvable into a weakness of resistance, congenital or acquired, of the vaso-motor system. And Féré quotes with approval the remark of Marshall Hall that hysteria is 'very much a disease of emotion; the same organs, the same functions are affected.' It is also worthy of note that the special tendency of women to be affected by the disease of the eyes called glaucoma, which is accepted by nearly all authorities, is also referred

[1] H. Head, Croonian Lecture, *Proc. Roy. Soc.*, B, 1921.
[2] Blair Bell, *The Sex-Complex* (2d ed.), 119.

by Priestley Smith to the greater instability of the vaso-motor system in women, and particularly to the disturbances of circulation which emanate from the generative organs.[1] We can in fact conclude with Solis-Cohen that women are strongly predisposed to all forms of disordered vascular innervation, from Reynaud's Disease in which the vessels are contracted, to Graves Disease in which they are relaxed.

Women are more liable than men to convulsive manifestations. This special convulsive tendency is expressed in the greater frequency in women of epilepsy, which may be roughly defined as a vaso-motor and neuro-muscular spasm of extreme violence, affecting primarily the brain, and secondarily the whole body. As Gowers pointed out, it is based on an abnormal readiness for action, or in other words an undue affectibility. The difference in sexual incidence is marked even during the first year of life.

The general convulsive tendency of women in its broadest aspects was long ago admirably discussed by an eminent gynæcologist, Robert Barnes, in his Lumleian Lectures on the convulsive diseases of women. Women's special proclivity to convulsive nervous diseases, he remarked, depends upon the reproductive functions, the great convulsive disorders of women being almost entirely limited to the period of reproductive activity. It is in the breeding season that the nervous excitability of the frog attains such a height that slight irritation of the skin will produce almost tetanic convulsions; 'it is easy to perceive analogous phenomena, sometimes quite as pronounced, in the human female, at the advent of puberty, at the periods of ovulation, during gestation, and eminently during the act of labour.' Labour, he observes, is a series of convulsions, and during a labour pain, 'the resemblance to epilepsy is, for the moment, so close that the two conditions can hardly be distinguished.' The very periodicity of the

[1] P. Smith, *Pathology of Glaucoma*, 132. Wagner found at Odessa that among over 1200 cases of glaucoma, 62 per cent were in women.

sexual life in women indicates an accumulation of nerve force ready to use when the periodic occasion arises, or to burst out tumultuously. Barnes clearly realised the intimate association between the convulsive proclivity of women and their proclivity to emotion, which takes a large part in every act, or process of the generative function. 'Emotional affectibility is the measure of convulsive liability.' [1]

Blushing, which Darwin called the most human of all expressions, is a vaso-motor nerve storm of spontaneous and uncontrollable character. Its much greater frequency in women affords evidence, that needs no insistence, of a greater affectibility of the vaso-motor system.[2] Partridge found that in those cases in which he had data as to age, there was a chief maximum between the ages of fifteen and eighteen (more especially at the earlier age), and a secondary maximum at twelve; this corresponds curiously with the maxima for the appearance of epilepsy, and clearly indicates the intimate connection of blushing with the sexual life.

One of the bases of the affectibility of women, and the convulsive tendency, is to be found in the reflexes. To say that women are more affectible than men, and more emotional, means in part to say that reflex action is more developed than in men and less under control of the higher centres. In other words they are, in the widest sense of the term, more ticklish. Dr. Gina Lombroso examined a large number of persons, children and adults, normal and abnormal, of both sexes, as regards the reflex responses of those parts of the body most sensitive in this respect,

[1] R. Barnes, 'The Convulsive Diseases of Women,' *Brit. Med. Jour.*, April, 1873.

[2] The physiology and pathology of blushing were investigated by Darwin, *Expression of the Emotions*, and H. Campbell, *Flushing and Morbid Blushing* (1890). Tilt found that flushes occurred in 244 women out of 500. Partridge (*Ped. Sem.*, April, 1897) studied the phenomena of blushing in 120 cases (of which 84 were females) and of flushing in 134 cases, of which nearly all were women, or girls who had reached the age of adolescence. Blushing refers to the objective phenomena of this vaso-motor storm, and flushing to its subjective phenomena.

especially the abdomen and the soles of the feet. She found these very marked in children and in young people from fifteen to eighteen, but much diminished in adults; while the results as regards adults are not very clearly presented, it would appear that marked responses, as regards both abdominal and plantar reflexes, were distinctly more frequent in the women than in the men.[1] Francotte of Liège has studied the radio-bicipital reflex in over 500 individuals of both sexes divided into various normal and abnormal groups. In all groups its absence was much less frequently found in women than in men. Its exaggeration, showing undue reflex hyper-excitability, was especially found among anæmic and neurotic subjects.

Emily Williams investigated in Chicago the patellar reflex (or knee-jerk) of 63 men and 70 women, between the ages of 18 and 24, all normal and living under similar conditions; she employed a mechanically operated hammer. The average response was 35 cm. for the men and 48 cm. for the women. She concluded that the excitability of women is greater. There was more variation among the men and more frequent complete absence of reflex.

Burt and Moore, in measuring the galvanometric reflex under various stimulations, found the response to emotional disturbances greater in women. The sex difference appeared at an early age.

The reflex wink, or the response of the eyelids to a sudden stimulus presented to the eyes, was studied by Partridge among 1100 school children at Worcester, Massachusetts. He tested ability to inhibit the wink when a visual and auditory stimulus was presented to the eyes on the other side of a piece of plate glass. The control of the wink was gained much more speedily with increase of age. In boys this increase with age was rapid and regular; with girls it was less rapid and more irregular; with a marked regression at the age of eight, a slight one at 10,

[1] *Compte-Rendu Cong. Int. d'Anth. Crim.* (Amsterdam, 1901), 295.

and a very marked regression, almost falling back to the level of the age of 6, at 12 years. Partridge refers to 'the fuller neuro-muscular training which the average boy receives from his freer life,' but he cannot explain the regression of girls at 12; it would be interesting to know if the plantar and other reflexes show a similar deviation at this age. Irrespective of age the average number of winks was 19 for a boy and 34 for a girl.[1] Allied evidence of the convulsive tendency in women is furnished by the facility with which they yield to tears and laughter. Tears are defined by Sir B. W. Richardson as 'the result of a nervous storm in the central nervous system, under which there is such a change in the vascular terminals of the tear-secreting glands that excretion of water from the glands is profuse'; he points out that tears are not produced by pain even when amounting to agony, but occur when the sympathetic nervous system is most developed and most impressionable, and the great emotions of fear, grief, and joy most active, and that hence it is that women are more given to tears than men. As regards laughter, Louis Robinson suggested that it has its basis in the reflex phenomena of tickling.[2] Pouting, again, is a charac eristically childlike method of automatic response to external stimuli which is rarely seen in its most emphatic forms in adults, except sometimes during insanity; in a very slight but still quite perceptible form it is, however, fairly common in women, especially as the unconscious indication of an offended dignity which cannot find expression in words.

Women's faces are more expressive than men's, or, rather, it would be better to say, they are more mobile; that is to say, that there is greater neuro-muscular affectibility. If we watch the faces of the men and women in a crowded city, where people think themselves sheltered by numbers from inquisitive observation, it will be seen that

[1] Partridge, *Am. Jour. Psych.*, Jan., 1900.

[2] The psychology of tickling was studied by Stanley Hall and Arthur Allin (*Am. Jour. Psych.*, Oct., 1897). Numerous studies of laughter have appeared, especially in France. Special mention may be made to Bergson's.

while the men more usually have a fixed immobile expression, the women's faces are more usually in actual movement, the mouths twisting and the foreheads wrinkling, seeming to indicate an early stage of physiological distress. It cannot strictly be said that the women's faces are more expressive; for if the men's stereotyped features may express a mood that is past, the fluctuating and evanescent muscular movements on the women's faces have not yet become coördinated into the expression of a definite mood. They are for the most part the play of a neuro-muscular mobility still submerged beneath the level of consciousness. Children's faces are extremely mobile. Francis Warner, who examined 100,000 school children, found that the signs of undue nervous mobility are more common in girls, and that 'defective expression' is much more rarely met with in girls.[1] In insanity women's faces usually express in a much higher degree than men's the apparently constant presence of intense emotional conditions. The mobility of women's faces is due to their affectibility to stimuli both from within and from without; in the latter form it is closely related to suggestibility, which is indeed but one of the forms of women's affectibility. A woman instinctively responds more easily than a man to influences from without, even in spite of herself. A young woman, especially if her nervous control is at all defective, involuntarily changes when an individual of the opposite sex approaches; however indifferent he may be to her personally, she cannot prevent the instinctive response of her vaso-motor and muscular system, and becomes at once shyer and more alive. Again, a man's rigid facial expression does not respond as a woman's does to the faces it encounters. I have noticed the haggard face of a young woman whose child had just died break out momentarily into a pleasant automatic smile in response to the smile of

[1] F. Warner, *Report of a Committee as to Average Development and Condition of Brain Function among Children* (1888); and the same author on 'Expression, Facial,' in *Dict. of Psych. Med.*

an acquaintance; this could scarcely have happened to a man.[1] A large portion of the 'tact' of women has the same basis. This affectibility has often been brought as a reproach against women, even by their own sex, but we must remember that to a large extent it is physiological.

The affectibility of the involuntary muscular system is shown in ways that are not easily open to inspection, or which are not obvious. The pupil of the eye dilates involuntarily to all sorts of slight stimuli. Not only is it affected by light as well as in association with accommodation and convergence of the visual axes, but the irritation of almost any cutaneous nerve, as by pinching or pricking the neck, arm, or leg, and the stimulation of some of the nerves of special sense, as by a loud noise, and various emotional conditions, all produce dilatation of the eyes. This result, according to Moeli and others, is much more constant in women and children than in men. The bladder, although its affectibility to faint stimuli is not easily demonstrated, is, as Mosso and Pellacani have shown, an even more delicate æsthesiometer than the iris, and is probably the most delicate in the body. Mosso and Pellacani found that contraction of the bladder follows directly on the slightest stimulation of any sensory nerve, and also that all the varying conditions of the organism which raise the blood-pressure and excite the respiratory centres produce an immediate and measurable effect upon the bladder. These investigators found, by experiments upon several young women, that when a plethysmograph was brought into connection with the bladder, even a slight touch with the finger on the back of the subject's hand produced a notable contraction of the bladder, and whenever the subject spoke, was spoken to, or made the slightest mental exertion, there was a similar contraction. Such contraction plays a part in the constitution of various emotional states

[1] Pepys wrote in his *Diary* (22 Jan., 1668) that he had been comforting his cousin, Kate Joyce, whose husband had just committed suicide, and adds: 'I find she can, as all other women, cry and yet talk of other things all in a breath.'

of fear, anxiety, and suspense. In its extreme spasmodic form, as incontinence of urine, it is common in children, and by no means uncommon in young women, apart from pregnancy or the results of pregnancy, though rare in men.

No doubt other organs, if we could examine them with equal precision, would furnish similar evidence to that furnished by the heart, the iris, and the bladder. The comparatively larger size of the abdominal and some other organs in women, and the comparatively greater range of their physiological action, furnish a visceral basis for the greater affectibility of women.

Fright is an emotion in which these phenomena play a conspicuous part, and fear is seen in women far more than men.[1] Among the less educated classes more especially, it is noteworthy how the women will start and call out in the presence of any unexpected phenomenon, although men of the same class are quite unmoved. Some Prussian statistics of suicide among school children show that while 'fear of punishment' caused 19 per cent of the suicides among the boys, it was responsible for 49 per cent among the girls. This characteristic has probably been fostered in the past by both men and women, since it led to displays of strength and protection on the part of the man towards the woman which were equally gratifying to both parties. Fright is a frequent origin of nervous disease in children and in women, but rarely in men. In the causation of epilepsy, according to Gowers, it is equally effective in each sex during childhood; at puberty it is most effective in girls; after twenty it is seldom traceable in men, but is still a relatively frequent cause in women. Chorea, again, or St. Vitus's dance, is a disease which is frequently caused by fright (in 27 per cent cases, according to the Collective

[1] Among children it is common in both sexes, though there are some sexual differences in the objects which arouse fear. Monroe found that boys were more afraid of natural phenomena, of human beings, of animals (girls were more afraid of snakes and lions, but boys more afraid of mice), while girls were more afraid of artificial things (like railway trains and fireworks) and of ghosts.

Investigation Committee of the British Medical Association), and simulates the defective muscular control and incoördination of fright; it is sometimes caused by imitation, and is altogether a disorder to which females are predisposed. On the whole, about three females are affected for one male; the preponderance of girls, as we should expect, is least marked in childhood; after sixteen, when the disease falls markedly in frequency, it is rarely seen in boys, and between the ages of twenty and thirty it is practically confined to women.

It may be added that all nervous diseases are in women largely due to emotional causes. Hammond in America was inclined to think that moral and emotional insanity without marked intellectual aberration is more common in girls than in boys. Pitres in France found that emotion is influential in causing nervous disease in 54 women out of 69, but in only 8 men out of 31. It is due to their suggestibility that women are more liable than men to be affected by communicated insanity or *folie à deux*.

It is owing to the great suggestibility of women, also, that nearly everywhere hysterical manifestations in women have from time to time tended to take on an imitative character, so that the women thus affected have simulated the actions and especially the cries of various animals — dogs, cats, sheep, doves, etc. The prevalence of such manifestations of vocal hysteria in women has been noted for two thousand years.[1] Obsessions which, as we have seen, are much more frequent in women, are a special form of morbid emotivity, and are most usually caused, on a predisposed mental soil, by strong moral emotions, religious or sexual preoccupations, terror, or even horrible dreams; Pitres and Régis found that it is at puberty, between 11 and 15 years of age, that obsessions most usually begin to take root in the mind, and that it is between 26 and 30 (also a some-

[1] F. Houssay, *Rev. Mens. de l'Ec. d'Anth.* (1898), 209. We are here brought near to manifestations more or less identical with those we encountered in chapter XII.

what critical age in women) that they most usually develop. It is the same suggestibility that causes women to be less subject to nostalgia, or home-sickness, than men, and more adaptable to changes of habit and new impressions.[1] In a similar manner, as is frequently seen, the wife of the 'self-made man' is often better able than her husband to adapt herself to the manners and customs of the new circles in which she moves.

Some experimental results in psychology indicate that the affectibility of women shows itself even in comparatively unemotional departments, and exercises a disturbing influence on their sense-judgments. Thus Gilbert found that in experiments devised to show the influence of size in affecting judgments as to weight, among 2000 school children between the ages of six and seventeen, except at the age of nine when both sexes are equal, girls are throughout more suggestible than boys to the deceptive influence of size, girls being most inferior to boys during the last three years.[2] Triplett found also that 60 per cent girls, and only 40 per cent boys, were deceived by the pretence of throwing a ball into the air.[3] A similar influence is exerted in the moral sphere, and it has been found by Doorlap that in moral judgment women tend to give heavier weight both to good and bad judgments. Tanaka in Japan came to much the same conclusion.

Irascibility — 'irritability' in the more homely sense of the word — is a form of affectibility which has in all ages, and perhaps quite legitimately, been attributed to women.[4] As Terence said —

> 'Mulieres sunt fermè, ut pueri, levi sententia;
> Fortasse unum aliquod verbum hanc inter eas iram conciverit.'

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[1] Widal, Art. 'Nostalgie,' *Dict. ency. des Sci. Méd.*

[2] *Studies Yale Psychological Laboratory*, II (1894), 61.

[3] *Am. Jour. Psych.*, July, 1900, p. 111. It should be added that Dressler (*Am. Jour. Psych.*, June, 1894), testing illusions of weight due to size among a small group of children, found the boys more suggestible; he also found that the most intelligent children were the most suggestible.

[4] See, for example, Lombroso and Ferrero, *La Donna Delinquente*, 147–48.

In its most extreme form this tendency shows itself in reckless and uncontrollable outbursts of purposeless destruction. This may best be studied, although not exclusively, in the prison and the lunatic asylum. In prisons spasmodic 'breakings out' of wild destructive violence are in England usually regarded as peculiar to the woman's side.

The greater obstreperousness of the female patients in lunatic asylums is well recognised; as Clouston remarks, 'there is ten times as much noise in the female wards as there is in the male wards';[1] and, as the same authority also points out, in the insanity of puberty a destructive tendency in the female seems to take the place of pugnacity in the male.[2] The greater noisiness and talkativeness of insane women is by no means confined to one race. It has been noted by Raggi in Italy, and among so calm a people as the Russians I noted during a visit to the Alexiev Municipal Asylum in Moscow in former years that it was found necessary to confine a few noisy women in solitary rooms, while on the men's side, the assistant physician informed me, all was quiet. Näcke of Hubertusburg, dealing with women who were at once both criminal and insane, found that among 53 individuals as many as 41 showed extreme irritability; 23 were violent and liable to attack the attendant or the doctor, more especially at the menstrual epoch; most of these, although not all, were destructive, and in their wrath would destroy furniture, bed-clothes, their own garments, and especially window panes; of the latter several destroyed about forty per annum each. The 'breaking out,' or *Zuchthausknall*, in its most sudden, violent, apparently unmotived, and almost epileptic form, was found by Näcke to occur in 12 cases.[3] One reason why women love dancing is because it enables them to give harmonious and legitimate emotional ex-

[1] *Jour. Mental Science*, April, 1893, p. 314.
[2] Clouston, Art. 'Developmental Insanities,' *Dict. Psych. Med.*
[3] Näcke, *Verbrechen und Wahnsinn beim Weibe*, 78.

pression to this neuro-muscular irritability which might otherwise escape in more explosive forms. Music, in a slighter degree, satisfies the same craving, for in a muffled but harmonious manner it exercises the whole of the emotional keyboard.[1]

In this connection mention may be made of the extravagant exaltation of obscenity and cruelty, surpassing that of men, to which women have been carried in times of popular epidemics of passion and excitement; this has been pointed out by Diderot, Despine, Lombroso, Ferrero, and others. Zola has given an artist's picture of it in 'Germinal.' From time to time during the Great War it was noted how (to quote from one report) 'the women were worse even than the men.' Their display of spite, their heartless cruelty, their profusion of gross insult were barbarous beyond all words. One officer tells how a woman of the Red Cross brought him a glass of water, spitting in it first. Such observations were made with special frequency in the Balkan countries, nearer to barbarism. Well-dressed women were seen, inciting the children to join in the revel, with knives or hatchets, or rifles, stabbing and torturing, or shooting men in the back, and women who had no other weapon would use their teeth. This was in 1916. Buschan notes similar characteristics in feminine criminality generally as compared with criminality in men. We find this extreme in women, just as we find — and far more commonly — the opposite extreme of devotion, tender-heartedness, and self-sacrifice.

There is physiological ground for the saying that every woman carries a slumbering *pétroleuse* in her bosom. Lom-

[1] In a thoughtful and interesting paper on 'The Sexes in Lunacy' (*St. Bartholomew's Hospital Reports*, XXIV, 1888), Dr. T. Claye Shaw discussed many of the points we are concerned with here. His paper is full of instruction regarding the affectibility of women generally. He describes the large but concealed field of sexuality in women which comes to the surface during insanity. That the concealed sexual contents of women's minds tend to be much greater than of men's is indicated by the far larger proportion of anonymous letters of a sexual character written by women (*Zt. f. Sexualwiss.*, May, 1920, p. 52).

broso pointed out that while women generally take a very small part in revolutions, they take a large part in revolts. I may mention a typical instance, which occurred when I was in Barcelona during the revolt of the workers in 1901, and excited general comment. A young Catalan woman of the people placed herself at the head of a large body of strikers, mostly men, and displayed immense energy in organising and leading them. Nobody knew who she was, and when martial law was proclaimed in the city and the revolt subsided, she silently retired into the obscurity from which for a moment she had emerged.

Their exuberance of emotionality under conditions which remove the normal restraints suggests that women, unlike the majority of men, really enjoy emotion. This is undoubtedly often the case, and it serves indeed to explain much that is sometimes more unkindly accounted for. Heymans has some suggestive observations on this point. Recalling the remark of Laura Marholm that for women the average man seems to be 'a meditative smoking animal,' he continues: 'Women not only have, but desire to have, the manifestations of strong emotion. This forms, in a manner, their natural element, which they may temporarily desert, but in the end find as necessary to their comfort as water to a fish, so that even the temporary absence of it causes them an abnormal emptiness. Therefore women do not avoid, they even seek, emotional stimulation, even such as springs from the alternation between hope and fear, so long as the intensity and duration of the tension do not overpass certain limits. In this way the apparent cruelty of woman is explained as well as her sympathy, her love of daring as well as her timidity.

It must be added that this affectibility, and the dangers and excesses in which it is liable to run, cannot fail to be without a reactionary tendency. At this point, therefore, some mention may be made of a characteristic which, while less conspicuous, may also be said to be predominantly feminine: a greater degree of self-suppression. Sup-

pression is regarded by Freud as an essential element in hysteria, and experiment has shown in psychological tests the tendency of women to censor and suppress their first impulses.[1] There is thus a tendency to inhibition, itself accompanied by emotional excitement, with the object of protection against embarrassment. The greater affectibility of women leads to a greater tendency to guard against affectibility.

The evidence brought together in this chapter will help to make clear the statement made in the chapter on 'The Senses,' that a quick response of the vaso-motor and muscular organism to stimuli, from within or from without, has no connection whatever with delicacy and precision of response in the sense-organs. It remains to point out that the results here reached are in harmony with those we have reached when considering other groups of phenomena.

In considering 'Motion,' I referred to the interesting experiments of Riccardi, showing how women, in making muscular exertion with the dynamometer, tend to reach their maximum power at the first effort, while men more often only attain their maximum power at the second or third effort.[2] In the vital functions of women generally a similar tendency has been found. There is a daily rhythm of vital function and efficiency, affecting the heart, lungs, temperature, etc., as well as the more voluntary motor and mental activities, and all these activities tend to vary together, with a minimum about 5 A.M., and a maximum about 5 P.M. Marsh, who made many observations on this point, finds that, throughout, women, as well as children, reacted to an earlier maximum at a more rapid rate.[3] The

[1] Haggerty, *Am. Jour. Psych.*, July, 1913.

[2] It may be added that Riccardi has been confirmed by Wissler in New York (*Psych. Rev. Monographs*, III, no. 1); Wissler found that 80 per cent women reach their maximum strength with the dynamometer at the first effort, but only 61 per cent men. So also in regard to tapping tests, F. L. Wells, *An.. Jour. Psych.*, July, 1909.

[3] H. D. Marsh, *Arch. of Phil., Psychol., and Scientific Methods*, July, 1906.

fact thus clearly brought out has a distinct bearing on the affectibility of women. As Féré expresses it, women exhibit a congenital exhaustibility, and, as among children, savages, and nervous subjects, their motions and their emotions are characterised by a brevity and violence which approach to reflex action.[1] To some extent affectibility is simply a tendency to fatigue. Galton once carried on an interesting investigation among teachers as to the signs of fatigue. Summarising the results of answers received from 116 teachers, he found that nervous fatigue is chiefly revealed by involuntary muscular twitchings of the face, fingers, etc., grimace, frowning, compression of lips, tendency to nervous laughter, and general muscular unsteadiness. There are also vaso-motor symptoms, pallors, flushings, and various alterations in the colour of the face and ears; also depression and hyperæsthesia of the senses. These are all manifestations of 'irritability,' which in its common mental form the teachers acknowledge to be 'perhaps the commonest sign of incipient mental fatigue.'[2]

Lack of 'staying power' is the popular way of expressing the neuro-muscular exhaustibility of women, and, as we have previously seen, this is everywhere found to characterise the work of female clerks in the Post-office etc.; under ordinary circumstances the women are equal to the men, but they cannot work under pressure. It is sometimes said that women are more easily distracted from their work; 'a man could talk and work at the same time, but when a girl talked she stopped work.' In Germany, during the Great War, when women were employed as car and omnibus conductors, there was much trouble and friction. They were said to be less amenable to discipline than men, less reliable and trustworthy, and more casual in their ways. If there is any element of truth in this, we must largely connect it with this congenital exhaustibility of

[1] Féré, *Pathologie des Emotions* (1892), 398, 480. Dr. Mary Jacobi made a similar statement, *Question of Rest*, etc., 204.

[2] F. Galton, *Jour. Anth. Inst.* (1889), 157.

women. It may be added that this quick exhaustibility of women is not due to the special conditions of civilised life, but is also found among savages. Thus Landor, among the Ainos, noted that most of the hard work is done by the women, who surpass the man in muscular strength, and, at all events as regards manual labour, in endurance. But at the same time he found that they could not compete with men in work leading to severe and prolonged fatigue; in walking and running a woman was as good as a man for one day's journey, but not for longer distances. The same characteristic marks savages as compared with Europeans; thus the Rev. W. Grey, who is himself accustomed to manual labour, writes of the natives of Tanna: 'In steady pick and shovel work the natives could do more than I could the first day. We were about equal the second day. On the third day they fell far behind me.' [1]

It may seem that this characteristic of women's neuromuscular energy is an unmitigated disadvantage, but this is by no means the case. Not only is it associated with the greater readiness of women, but it is an extremely valuable safeguard. Men are able to undergo far more prolonged and intense exertion than women, but they purchase this capacity at a price; the resulting collapse, when it comes, is more extreme and more difficult to recover from. Women yield to the first strain, but for that very reason they quickly recover. Energetic women, who are able to disregard physiological warnings, naturally suffer from more serious collapse, as men would. As a rule, their affectibility protects women from the serious excesses of work or of play to which men are liable.[2] The frequency

[1] *Jour. Anth. Inst.*, Aug. and Nov., 1898, p. 128. It may be added that the predominence in women of many of the characteristics noted in the previous pages, and of others of related character, is confirmed by the *enquêtes* of Heymans, who gives definite percentages, *Psychologie der Frauen*, 67, etc.

[2] Pierre Roussel, in what may perhaps be considered the first attempt to write a scientific book about women, *Système Physique et Moral de la Femme*, more than a century and a half ago, considered the affectibility of women, or, as he termed it, their less resistance, to be an essential and necessary compensation in relation to the various and sudden changes which take

and comparative triviality of nervous disorders in women, their much greater seriousness and fatality in men, largely finds its explanation here. That women are more often attacked by most zymotic diseases than men, but more rarely die from them, seems to be a fact belonging to the same group.

The neuro-muscular exhaustibility of women is no doubt associated with the fact — which we encountered when considering 'Metabolism' — that the blood of women tends to be more watery than that of men; in women, a certain slight degree of anæmia may possibly be regarded as physiological.[1] But anæmia increases affectibility; in an anæmic woman a very slight stimulus or exertion produces too strong a reaction; to live healthily she must live at a low and slow rate of tension.

The question still remains how far the affectibility of women is natural and organic, how far it is the mere accidental result of external circumstances.[2] Is the greater emotionality of women a permanent and ineradicable fact? There can be no doubt that to a very large extent emotionality may be modified. What I have termed hypnotic phenomena, perhaps as common in men as in women among savages, are rare among civilised men. The men of to-day are not so emotional as the men of the thirteenth century; the modern English gentleman does not talk and behave like the English gentlemen who killed

place in the feminine organism. 'It was necessary,' he wrote (p. 11), 'that the organs of women should be of a structure able to yield to the impulsion of causes acting strongly upon them, and mutually to supplement each other when their respective functions are deranged. Nature, in men, seems to surmount the obstacles which oppress her by strength and activity; in woman she seems to withdraw from their action by yielding. If strength is essential to men, a certain weakness seems to be a part of the perfection of women. This is even more the case in moral than in physical respects.'

[1] See Stephen Mackenzie's Lettsomian Lectures on Anæmia, *Brit. Med. Jour.* (1891), I, for evidence showing that the physical characteristics of the anæmic are an exaggeration of those of women generally.

[2] It used to be said that the greater emotionality of women as revealed by test experiments was due to the male sex of the experimenter. That is a factor to be taken into account, but is now balanced by the larger number of female experimenters.

Thomas à Becket. The woman of to-day, again, is less emotional than her great-grandmother a century ago; she is not subject to vapours and swoons on trivial occasions to anything like the same extent. The mere fact of the immense difference on the whole which exists as regards emotionality between women of different social classes (and which, as we have seen, is removed when the restraint of sanity is removed), suggests that emotion, in its coarser manifestations at all events, is to a large degree educable. The attention that is now, fortunately, beginning to be given to the physical culture of women will undoubtedly tend to strengthen and develop the neuromuscular system. Just as we have sure reason to believe that sensibility may by training be increased, so there is still greater reason to believe that affectibility may by training be decreased.

That there is, however, a limit to this sexual equalisation of affectibility we saw at the outset. The comparatively larger extent of the sexual sphere in women and of the visceral regions generally — for in women at puberty, as Dr. Campbell puts it, a new keyboard and fresh series of pipes are added to the instrument — and the existence of inevitable periodicity of function in women, conspire, with the associated endocrine balance, to furnish a broader basis for the play of emotion which no change in environment or habit could remove. As Heymans well shows, all the most characteristic features of women's nature are correlated with emotionality, and the half of women's psychic nature would remain unexplained if we struck out this factor. Affectibility in women may be reduced to finer and more delicate shades; it can scarcely be brought to the male standard.

This result is by no means to be regretted. We have seen that the affectibility of women ensures to them certain solid advantages, and assists to safeguard them against evils from which men are specially prone to suffer. Beyond this, if men and women were more on the same level as

regards emotionality, they would lose much of their power to help one another. They would certainly, also, greatly lose their power to charm one another. The man of facile emotions makes little impression on a woman; the woman who is lacking in emotionality leaves a man cold. As long as this is so we may be perfectly sure that — even if the greater affectibility of women had a less firm organic basis — men and women will never be equal in emotionality.

The affectibility of women exposes them, as I have had occasion to point out, to very diabolical manifestations. It is also the source of much of what is most angelic in women — their impulses of tenderness, their compassion, their moods of divine childhood. Poets have racked their brains to express and to account for this mixture of heaven and hell. We see that the key is really a simple one; both the heaven and hell of women are but aspects of the same physiological affectibility. Seeing this, we may see, too, that those worthy persons who are anxious to cut off the devil's tail might find, if they succeeded, that they had also shorn the angel of her wings. The emotionality of women, within certain limits, must decrease; there are those who will find consolation in the gradual character of that decrease.

CHAPTER XIII

THE ARTISTIC IMPULSE

The industries arose in women's hands, the arts in men's — Pottery — Tattooing — Painting — Sculpture — Music — Why women have failed in music — Metaphysics — Mysticism — Poetry — Fiction — Why women have succeeded in fiction — The supremacy of women in acting — The artistic impulse generally is more marked in men — The causes of this — Women in the art of creation.

PRIMITIVE women have in their hands all the industries, and, in consequence, the rudiments of most of the arts. But when we get beyond the rudiments the position begins to change, and when we reach fully differentiated arts, even among savages, we find that they are almost exclusively in the hands of men.[1]

The making of pottery is an industry which develops almost insensibly into an art. In nearly every part of the world pottery has at the outset been entirely, or almost entirely, in the hands of women, and so long as it remained in their hands the potter's industry has usually retained a severely practical character. It is sufficient to quote the evidence of one observer who possessed an intimate acquaintance with the lower stages of primitive culture. Miklucho-Macleay, speaking of Papuan art in North-East Guinea, remarks: 'I have been struck by the absolute absence of ornament on the pottery, the clay easily lending itself to all sorts of ornamentation; this lack of ornament is due to the fact that the manufacture of pottery is exclusively confided to women, who are not usually very artistic by nature. I have found confirmation of this ancient and just observation even among Papuan women. I am able to state that I have never seen the slightest ornament invented or executed by a woman. During a visit to the island of Bibi-Bibi, where pottery is manufactured

[1] This transfer of an occupation originally monopolised by one sex to the other sex is termed by Lasch, *Zt. f. Sozialwiss* (1908), 293, 'the secondary division of labour.' He gives many examples.

for all the neighbouring villages, when observing a dozen women and young girls fashioning pottery, I saw several women doing nothing; as they had in front of them a mass of pots without the slightest ornament, I asked why they did not ornament them. "What is the good? It is not necessary!" were the replies they gave. But this did not prevent two young boys from finding pleasure in imprinting with their nails and a pointed stick a sort of ornamental border on some of the pots.' [1] This observation may be said to be confirmed by observations among civilised children. In his interesting and searching investigation in the schools of the French-speaking cantons of Switzerland, Ivanoff found that in girls good drawing is merely a mark of general intelligence, and not a special aptitude. Among the boys, on the other hand, it was more *sui generis*, more autonomous. Among those girls whose school-work generally was weak, good drawing was only found in 1.4 per cent cases, but among the boys who were weak it was found in 11 per cent cases; this result was not accidental, for it was found in each canton taken separately.[2]

Tattooing is in many parts of the world chiefly in the hands of women. Thus among the Nagas of Assam it is 'often performed by old women of the chief's household, and as a matter of right.' [3] Among the Aino, also, tattooing is done by women, and at present indeed it is the women alone who are tattooed.[4] Again, among the Songish or Lkungen Indians of Canada the tattooing is done by women, who introduce charcoal beneath the skin by means of a needle held horizontally.[5] It must be remembered, however, that tattooing is by no means the pure outcome of the art impulse, but a social and religious

[1] *Bull. Soc. d'Anthropologie*, 19 Dec., 1878. Andree brought out the same point.

[2] E. Ivanoff, *Arch. de Psychol.*, Dec., 1908.

[3] Peal, *Jour. Anth. Inst.*, Feb., 1893, p. 247.

[4] MacRitchie, Supplement to *Internationales Archiv für Ethnographie*, Bd. IV (1892).

[5] *Brit. Assoc. Report on the North-Western Tribes of Canada*, by Boas (1890).

rite of a traditional character. Such semi-ritual art may be in the hands of either men or women; thus among the Papuans (according to S. J. Hickson) the designs on houses and praus are wrought by old men or priests of the village to keep off the spirits of storms.

If we turn to the pure artistic impulse, as manifested in the higher stages of culture, we find that the supremacy of men in painting is unquestionable. Even among school children boys are found to show more aptitude for drawing, notwithstanding the greater diligence of girls, and a smaller proportion of bad results. Thus in Switzerland, among over 250 scholars in four cantons, Ivanoff found that 21 per cent of the boys are good in drawing, and only 7 per cent of the girls; while only 12 per cent of the boys are bad, against 23 per cent of the girls. There have been thousands of women painters, but only the men have been remembered; it would be unkind to make a comprehensive list of famous women painters. Even the great central situation of Christianity, as of life — the relation of the mother to her child — which appeals so strongly to a woman's heart, has never received memorable rendering at a woman's hand. In sculpture, also, it is scarcely necessary to add, the great names are all men, from Phidias to Donatello, from Michelangelo to Bourdelle. That there have been two or three women whose names deserve honourable mention is the most that can be said.

In the evolution of music women have played a very small part. It does not appear that a woman has ever invented any well-known musical instrument, and there is not in any part of the world an instrument that is peculiar to women or chiefly played by them; it is rarely even that they perform on men's instruments. In aboriginal America Otis Mason remarks that musical instruments are never played by women, though they beat time on various objects and may now and then use the rattle, as well as join in certain choruses.[1]

[1] *Nature*, 13 Oct. and 17 Nov., 1892. There are a few exceptions to the general rule, especially the 'nose-flute' in the South Pacific.

Among barbarous and civilised races in all parts of the world women have been trained profusely to play on musical instruments; but the position of the sexes has remained relatively the same as among savages. The players of music have often been women; the makers of music have nearly always been men. Unless we include two or three women of our own day whose reputation has perhaps been enhanced by the fact that they are women, it is difficult to find the names of women even in the list of third-rate composers.[1]

'It is a mystery,' remarks Rubenstein in his book on 'Music and its Masters,' 'why it should just be music, the noblest, most beautiful, refined, spiritual, and emotional product of the human mind, that is so inaccessible to woman, who is a compound of all those qualities; all the more as she has done great things in the other arts, even in the sciences. The two things most peculiar to woman — love of a man and tender feeling for a child — have found no echo from them in music. I know no love duo or cradle song composed by a woman. I do not say there are none, but only that not one composed by a woman has the artistic value that could make it typical.' Music is at once the most emotional and the most severely abstract of the arts. There is no art to which women have been more widely attracted, and there is certainly no art in which they have shown themselves more helpless.

Similarly in literature, as Jean Larnac has pointed out,[2] the great efflorescence of fiction among French women has produced no memorable books dealing with maternity; a few deal with it, but none among them are likely to reach posterity. Larnac justly remarks that the elementary

[1] There is, I believe, no difference of opinion whatever on this point. See, for instance, G. P. Upton, in his intelligent and sympathetic little book, *Woman in Music*; he endeavours to magnify the part that women have played in music, but he recognises that none of the masters in music have been women. Vaerting, while admitting the small place of women in creating music (*Zt. f. Psychotherapeut.*, 1917, p. 124), considers that they are born musical critics.

[2] *Nouvelles Littéraires*, 5 Jan., 1929.

immediate sensations and emotions will not compose a work of art; it is necessary to stand far back from them, and it is not easy for women to stand back from these experiences; 'a long decantation is needed to separate the disturbing elements from the essential values, and then a crystallisation of the living matter into plastic matter.'

It cannot be said that literature is an art. It is merely a method of recording very diverse manifestations of psychic aptitude and artistic impulse. It is enough to mention four of these — metaphysics, mysticism, poetry, fiction.

It is remarkable that although women are so strongly drawn to religion, they have done almost nothing to give classic expression to that mysticism which is the kernel of religion everywhere. The great manuals of devotion which have fed so many thousand souls, and which all say the same thing in different ways — the manual of Lao Tze, Marcus Antoninus's 'Meditations,' Epictetus's 'Encheiridion,' the Gospel of Saint John and the Epistles of Saint Paul, the 'De Imitatione Christi,' the 'Deutsch Theologie,' much of the writings of Schopenhauer — are the work of men, although they have probably found, on the whole, at least as many readers among women as among men. St. Theresa is, so far as I know, the only woman who might be put in the first rank, but it must be added that there is an element of unquestionable morbidity in her work which cannot be said to characterise any of the great mystics I have named, not even Saint Paul or Schopenhauer.

The art of metaphysics belongs almost exclusively to men. Even in the third rank of metaphysicians the names of no women can yet be very clearly discerned. The philosopher's art consists in building up an ideal and conjectural world on the basis of his own psychic organism; it is of all arts that in which emotion is most highly intellectualised, and the material most abstracted from the practical and concrete. Whether women's failure here means the condemnation of metaphysics or the condemna-

tion of women is a problem which everyone will decide according to the basis of his own temperament.

Karl Bücher considers that as in primitive times women worked together with men in many more ways and more complex ways than has since been the case, they furnished the first germ of poetry to a much greater extent than men. The period of men's activity in poetry came later.[1] In modern poetry, however, women have done much more than in either mysticism or metaphysics. A strong emotional poetic energy, chiefly lyrical in form, has been expressed by the women of many lands. At the same time it has had a tendency to be either rather thin or rather diffuse and formless. Strong poetic art, which involves at once both a high degree of audacity and brooding deliberation, is very rare in women. There is Sappho whose lofty genius is beyond dispute, but it is difficult (I will not say impossible) to find women poets who show in any noteworthy degree the qualities of imagination, style, and architectonic power which go to the making of great poetry.

In fiction women are acknowledged to rank incomparably higher than in any other form of literary art. Thus in England, in Jane Austen, Charlotte and Emily Brontë, George Eliot, we find four story-tellers during the nineteenth century who, in their various ways, were scarcely, for the artistic quality and power of their work (although not for quantity and versatility), behind their best contemporaries of the male sex. In France, it is true, where the novel has perhaps reached the highest degree of artistic perfection, women, owing to a variety of circumstances, have produced little fiction of high artistic value; but in many countries of Europe at the present day, both in the north and in the south, there are women who stand in the first rank. It is only when (as in the work of Flaubert) the novel almost becomes a poem, demanding great architectonic power, severe devotion to style, and complete

[1] K. Bücher, *Arbeit und Rhythmus* (3d ed., 1909), 394 *et seq.*

self-restraint, that women have not come into competition with men. But fiction in the proper sense makes far less serious artistic demands than poetry, inasmuch as it is simply a version of life, and may claim to follow any of the sinuous curves of life. What it demands is a quick perception of human character and social life, coloured by a more or less intense emotional background. A vivid perception of social phenomena — of the interaction of men and women which is the basis of fiction — is natural to all women, who are, in a sense, more close to the social facts of life than men. They are, too, more receptive of detailed social impressions and more tenacious of such impressions.[1] In the poorest and least cultured ranks the conversation of women consists largely of rudimentary novelettes in which 'says he' and 'says she' play the chief parts. Every art, one may say, has an intellectual and an emotional element: women have done so well in fiction because they are here organically fitted to supply both elements. In fiction women possess a method of self-expression which is artistically well within their grasp.

On the whole, however, even when we take fiction into account, it cannot be said that women have reached the summits of literature, although literature is of all methods of expression that which has been most easily within their reach. There are doubtless many reasons why this should be so, although these reasons do not easily come within the region of exact research. It is possible, for instance, that one factor may be found in that quick affectibility and

[1] This social impressionability of women must still be admitted, even though we accept the statements of Groos and Durkheim, that in the deeper sense women are less socialised than men. Groos remarks (*Spiele der Menschen*, 438) that women possess in a much less degree than men the sense of rigorous subordination to abstract law, and illustrates this by their greater willingness to cheat in various departments of life. He associates this characteristic with the absence of the discipline involved in the exercise of the male combative instincts. Durkheim (*Le Suicide*, 442) finds that women are nearer to nature, less the product of society than men, whose activities, tastes, and aspirations have to a greater extent a collective origin; in woman's less degree of socialisation he sees the explanation of various sociological phenomena, though he does not regard it as a final and ultimate fact.

exhaustibility which we have seen to characterise the nervous energy of women. In whatever direction a woman exerts her energies they are all swiftly engaged and no reserve is left. The qualities of Aphra Behn and of Emily Brontë have never been combined in one woman. Yet to be at once gay and profound — a combination supremely exemplified in Shakespeare — is part of the fascination and the power of nearly all the finest literature. Women have achieved complete success in letter-writing, and in love-letters they are supreme,[1] for here their special characteristics become of the first importance; but they have not on this basis wrought any literature of the highest order, such as we find in Montaigne, a great writer who may be said to have set out with the literary methods of a woman — spontaneity, carelessness of form, a very personal and intimate frankness.

There is, however, one art in which women may be said not merely to nearly rival but actually to excel men: this is the art of acting. In a land and in an age prolific in dramatic ability, Bachaumont wrote in his 'Mémoires' in 1762 that perhaps none of the great actors of his day were so transcendent as its four great actresses — Clairon, Dumesnil, Gaussin, and Dangeville. Half a century later Roussel wrote that there were more good actresses than good actors. The same might be said still later; Sarah Bernhardt and Eleanora Duse had no male rivals. If indeed, we look back at the history of the stage during the last two hundred years, against every famous actor whose name survives it seems usually possible to place a still more famous actress. With women's success as actresses may be associated their perhaps equally undoubted success as singers, singing being in part vocalised dramatic art. It is not difficult to find the organic basis of woman's success in acting. In women mental processes are usually more

[1] 'Thousands of women's letters,' truly remarks Mantegazza, 'that lie in the cabinets of lovers, and are eventually burnt, would, if they could be published, convince us that Madame de Sévigné has many rivals.'

rapid than in men; they have also an emotional explosiveness much more marked than men possess, and more easily within call. At the same time the circumstances of women's social life have usually favoured a high degree of flexibility and adaptability as regards behaviour; and they are, again, more trained in the vocal expression both of those emotions which they feel and those emotions which it is considered their duty to feel.[1] Women are, therefore, both by nature and social compulsion, more often than men in the position of actors. It is probable also that women are more susceptible than men to the immediate stimulus of admiration and applause supplied by contact with an audience. In the allied art of dancing women are also supreme.

On the whole, there can be no doubt whatever that if we leave out of consideration the interpretative arts, the artistic impulse is vastly more spontaneous, more pronounced, and more widely spread among men than among women. There is thus a certain justification for Schopenhauer's description of women as the unæsthetic sex. Even in the matter of cooking we may see how emphatic is the tendency for an art to fall into the hands of men. All over the world cooking, as an industry, is women's business, yet wherever cooking rises from an industry to become something of an art it is nearly always in the hands of a man.

When we consider the proportion of women, as compared to men, who obtain even moderate fame, we find that it is even at the present day, though doubtless rising, extremely small. As regards literature, Mantegazza examined the 'Dizionario biografico degli Scrittori Contemporanei' and found that among over 4500 writers of the nineteenth century only 4.1 per cent were women. In my own study of British genius, from the earliest period to

[1] It is worth remarking, in connection with the superiority of women in acting, that it has frequently been found that women, from the school age on, are also better readers.

the end of the nineteenth century (based on the 'Dictionary of National Biography'), I found that among the most eminent British persons in all departments, 1030 in number, only 5.3 per cent were women, and it has at the same time to be admitted that a minor degree of ability sufficed to ensure the inclusion of the women.[1]

Galton found, in investigating nearly 900 individuals, that 28 per cent males and 33 per cent females showed artistic tastes — i.e., were fond of music, drawing, etc. That is to say, that notwithstanding all that our education does to bring out artistic tastes in women, the sexes remain nearly equal.[2] If we go back to early times we may surmise that the rough drawings of natural objects which are found on primitive implements and on rocks are the work of men; this is indeed clearly indicated by the prevalence among them of figures of women and wild beasts. At the present day the impulse to scribble, draw, and carve — the artistic impulse in its most primitive form — is much more marked in boys and men than in girls and women. Both in colleges and prisons this difference is decided. It may thus probably be said that women are less imaginative than men. In her study of young children's fears, Katharine Fackenthal found that the boys showed much more originality than the girls, and a larger proportion of the objects of their fear were imaginary, though at this early age the sexual differences were slight.[3] If this difference is real it is not without significance, for it is on their fears and their desires that men's art is founded. Insanity, again, which is so instructive in the terrible clearness with which it brings to the surface the most fundamental impulses, reveals in women a singular imaginative poverty. The delirious ideas of women, remarks Toulouse,[4] one of the subtlest psychological students of insanity, are few in

[1] Havelock Ellis, *A Study of British Genius*, chap. I.
[2] F. Galton, *Natural Inheritance*, chap. IX.
[3] *Ped. Sem.*, Oct., 1895, p. 322.
[4] Quoted in *Arch. d'Anth. Crim.*, Feb., 1903, p. 122.

number and simple in nature; 'the insane woman is altogether lacking in invention in the conception of delirious ideas; she shows nothing of the wealth of extravagance manifested by men.' The characteristic ideas of grandeur which so often affect men are rare in women, and then usually of a feeble and pedestrian sort, Toulouse remarks, for the most part confined to the region of the toilet, or playing around a supposed secret legacy.

The assertion of Möbius [1] that the art impulse is of the nature of a male secondary sexual character, in the same sense as the beard, cannot be accepted without some qualification, but it may well represent an approximation to the truth.

Ferrero sought the explanation of the small part played by women in art, and their defective sense for purely æsthetic beauty, in their less keen sexual emotions.[2] The sexual sphere in women is more massive and extended than in men, but it is less energetic in its manifestations.[3] In men the sexual instinct is a restless source of energy which overflows into all sorts of channels. Thus it is at puberty that, even among a people of primitive culture like the Dayaks, the art impulse arises. Marie Grzegorzewska found in her careful study of the æsthetic aptitudes of 800 Belgian children that among those of poorer class such aptitudes develop but little before puberty; among those of better class, with an exuberance of energy, they tend to develop earlier; the boys predominated in the appreciation of technique and sensorial elements, which are the proper substance of art, the girls in imaginative and embellishing elements; it was towards the age of fourteen, that is to say at puberty, that the girls reached their imaginative maximum.

[1] P. J. Möbius, *Stachyologie*, 1901.

[2] G. Ferrero, 'Woman's Sphere in Art,' *New Review*, Nov., 1893.

[3] Havelock Ellis, 'The Sexual Impulse in Women,' *Studies in the Psychology of Sex*, III. The veil of anonymity enables the greater extent of feminine sexuality to be revealed. Thus Professor Dück of Innsbruck (*Sexual-Probleme*, Jan., 1914), found that of offensive anonymous letters coming before the courts, those of sexual content were in the case of women 55 per cent, in the case of men only 6.6 per cent.

When we examine the aptitude for art in a narrow and strictly limited sense it thus becomes clear that it is an aptitude for which, in its highest manifestations, men appear to be better adapted organically than women. If, however, we examine this conclusion with a broader sweep and from a higher standpoint we may not only be enabled to account for it but also to realise its significance and to understand that it involves no disturbance of the just sexual balance. If, indeed, it had involved such disturbance we might well have been suspicious of its validity.

We have here understood 'art,' following the conventional rule, as fine art. But that is an arbitrary limitation. Art is really the sum of all human plastic action. Rising still higher, and above the human limit, we may say that art is all creation. When we view the question of art from this height, the fine arts, to which we so easily lend an exaggerated and inhuman value, sink into their proper place, and women no longer appear at a disadvantage. We may even say that it is woman who is more peculiarly the creator by her predominant part in producing and moulding the race, as well as by the leading part which she necessarily plays in all the central human arts which the maternal function makes necessary. 'The majority of women,' Manouvrier pointed out, 'even without leaving their complex rôle of mother, educator, house-wife, husband-counsellor, family director, etc., possess a scope superior — even far superior — to that offered by most masculine occupations.' [1] Or, to turn to the opinion of a distinguished woman, Gina Lombroso-Ferrero remarks that since women possess the greatest of all privileges in the creation of life, it is possible to regard the liberties of power open to men in other directions as simple compensations for the secondary part they play in that great mission. 'Is not the tremendous strength in men of the impulse to creative work in every field,' another woman asks, 'precisely due to their feeling of playing a relatively small part

[1] *Rev. de l'École d'Anth.* (1909), 50.

in the creation of living beings?'[1] As Briffault truly points out, the power of creation in the fine arts is not the power of emotion, and emotion will not suffice to confer it; it is the power of transmuted emotion.[2] It is in the power of emotion and in its swifter modifications to become human arts that women are conspicuous. It is in the slower and more elaborated transformations that men prevail. In this sense it may truly be said that the excellence of men in the fine arts is a compensation.

[1] Karen Horney, *Int. Jour. Psycho-analysis*, Oct., 1926, p. 330.
[2] Briffault, *The Mothers*, II, 443.

CHAPTER XIV

THE INTELLECTUAL IMPULSE

There is no purely abstract thought — Difficulty of accurately investigating intellectual processes — Jastrow's investigations into thought-habits and associations — Memory — Rapidity of perception — Women read rapidly — The ready wit of women — Lying — The tendency to ruse and its causes — Precocity — More marked in girls — Conduct — Puberty and mental activity — Industrial and business capacity — Experiences of the post office — Abstract thought — The greater independence of men — Women as philosophers and mathematicians — Religion — Religious sects founded by women — Their general character — Politics — The wide activities of women — Criticism of the study of intelligence.

Under this heading we may conveniently consider various tendencies to think and to act according to what are usually considered rational motives. As a matter of fact even our most abstract mental processes are not abstractly rational. The dryest light of the intellect is coloured in infinite ways. If we could conveniently investigate, for example, the multiplication table — an apparently abstract possession common to most persons — as it exists in individual minds from early childhood onwards, we should find it curiously tinged with emotional and pictured associations, from the simplest shadings up to the elaborate visions of the colour-hearer. It may be safely said that no two persons possess the same multiplication table.

But even when we start with this innocent statement we at once find obstacles in the way. In the first place, we can only expect to find very small sexual differences. It is indeed only because there is no such thing as completely abstract rational thinking that we can expect to find any sexual difference at all. It is obvious that purely abstract thinking — supposing it possible for the human intellect to achieve it — would show no sexual difference. Then, as there is no need to insist, individual differences are always greater than sexual differences, and so obliterate

them. As Burt and Moore long ago pointed out, sexual differences are not so marked as was once commonly supposed; similarities are as frequent as differences.[1] It is not easy, moreover, to find comparable groups. Even college women may not be strictly comparable to college men, for, as Thorndike has pointed out, they are frequently selected by different agencies, the intellectual impulse being more powerful in sending the girl to college, convention in sending the boy. It is not surprising that the results in this field of many investigators are too rough to be convincing and might even lead us to suppose that no sex difference here exists. It is now generally agreed, however, that, as Otto Lipmann in one of the most careful and extensive studies of the question has said, it is no longer the *presence* but simply the *magnitude* of sexual psychic differences which we have to decide.

It is probable that, as Jastrow, one of the first investigators in this field, has always held, the tests which fail to reveal sexual difference are inadequate.[2] It may still be of interest to bring forward some of his earliest inquiries.[3] The first was into community of ideas and thought-habits, the nature of the more usual types of associations, and the time-relations of these processes. Fifty students (twenty-five of each sex) were asked to write down one hundred words as rapidly as possible. Words in sentences were not allowed. There were thus obtained 5000 words, and of these nearly 3000 were the same, showing how great is the community of our thoughts. This community is greater in the women; while the men used 1375 different words, their female class-mates used only 1123. Of 1266 unique words used, 29.8 per cent were by males, only 20.8 per cent by females.[4] If the words are all divided into classes

[1] *Journal of Experimental Pedagogy*, 1912.

[2] In a chapter on the 'Feminine Mind,' *Psychology of Conviction*, 1918. It may be remarked that sexual difference does not, necessarily, involve the assumption of distinct Masculine and Feminine Minds.

[3] *New Review*, Dec., 1891; *Educational Review*, 1891.

[4] This, I may note, agrees with what Terman found (*Genetic Studies of*

it is seen that among the men there was a much more frequent occurrence of words referring to the Animal Kingdom, Proper Names, Verbs, Implements and Utensils, Adjectives, Vegetable Kingdom, Abstract Terms, Meteorological and Astronomical, Occupations and Callings, Conveyances, Other Parts of Speech, Geographical and Landscape Features. Among the women there was a decidedly greater tendency than among the men to use words referring to Wearing Apparel and Fabrics, Interior Furnishings, Foods, Buildings and Building Materials, Mineral Kingdom, Stationery, Educational, Arts, Amusements, Kinship. The remaining classes of words, used with almost equal frequency by both sexes, were Parts of Body, Miscellaneous, and Mercantile Terms. The groups into which the largest number of the men's words fall is Animal Kingdom (254 to 178); the group into which the largest number of the women's words fall is Wearing Apparel and Fabrics (224 to 129); 'the inference from this that dress is the predominant category of the feminine (or the privy feminine) mind is valid with proper reservations; but we should remember that the dress of a woman is more conspicuous, more complex, and more various than that of a man, and that she has more to do with the making of it.' [1] In regard to Foods the difference is very great, much greater in fact than in regard to almost any other class of words; while the men only use 53 words belonging to this class, the women use 179; whether the part played by women in the preparation of food is sufficient to account for this great disproportion Jastrow refrained from deciding. 'In general,' he concluded, 'the feminine traits revealed by this study are an attention to the immediate

Genius) as to girls, in their reading, being more *homogeneous* than boys, who scatter their reading more widely and are more interested in what are considered 'serious' subjects. This is an aspect of what those who are obsessed by the mathematical 'variational tendency' would call the greater tendency of males to vary.

[1] Jastrow's results as to wearing apparel have been confirmed by some later investigators, and disputed by others. We need not of course regard them as necessarily resting on inborn difference.

surroundings, to the finished product, to the ornamental, the individual, and the concrete; while the masculine preference is for the more remote, the constructive, the useful, the general, and the abstract.' Another point worth mention is the tendency to select words that rhyme, and alliterative words; both these tendencies were decidedly more marked in men than in women. In regard to the time taken by the whole process there was practically no sexual difference.

Another series of experiments was made by Jastrow in order to test the processes of memory and association. The withdrawal of a screen revealed a word upon the blackboard, whereupon each member of the class wrote upon a slip of paper the first word suggested by the word on the board, and then folded the paper so as to conceal what had been written; another word was then shown and the process repeated until each student had written ten words. Two days later, the students were asked to write as many as possible of the words written previously, and in the same order. The original words were then again written on the board, and the students asked to write the associations recorded two days before. The results of the first test may be called the 'original lists,' of the second the 'A' lists, of the third the 'B' lists. The first showed the most accessible associations to ten common words; the 'A' lists showed to what extent such can be recalled by memory alone, upon short notice, and when written with no expectation of future use; the 'B' lists showed to what extent the recollection is aided by the presence of the suggesting words. It was found that of the words written by the men 40 per cent were completely forgotten, and 50 per cent correctly recalled, while the women forgot only 29 per cent and correctly remembered 58 per cent; that is to say, the women showed distinct superiority in memory. On the other hand, the 'B' lists were substantially alike in both men and women; in other words, the original word aids the men more than the women, and this makes the pro-

portion of forgotten and recalled words the same for both sexes. It was also found that while men favour associations by sound and from part to whole, women prefer associations from whole to part and from object to quality. Jastrow also organised some experiments on similar lines at the Milwaukee High School, and here also was shown, and in a still higher degree, the feminine superiority in memory. Here, also, the difference was lessened when the suggesting word was supplied. The sex difference was clearly greater in the high school; it also appears that while university boys remember better than high school boys, high school girls remember better than university girls. In many small points curious and unexpected sexual differences were found to be identical at the university and at the high school. In both, finally, there was found, as usual, greater community of association in girls than in boys. A greater uniformity of association, it may be added, has in Germany been attributed to a different amount of education, but this explanation would hardly apply under co-educational conditions.

Many experiments in association have since been made, especially with regard to their comparative rapidity. Such comparisons may be made either with *free* associations (number of words written in a given length of time) or *controlled* associations (such as arithmetical). The question of free associations is complicated by the fact that girls tend to write faster than boys. When this fallacy is eliminated it is found that boys more usually tend to be faster in free associations and girls in controlled associations. The cause of the more rapid free associations of men has been discussed by various writers, as by Wells and by Kempf. The general tendency is to attribute it to a greater disposition of women to interference and suppression of ideas. The woman is instinctively on guard against embarrassment and is controlling her ideas. Wells thinks that it is possible a woman investigator testing men might find them slower than women. Thus when testing mental sex dif-

ferences we are constantly brought into the emotional sphere.

Among German higher school children at Freiburg in Baden, Cohn and Dieffenbacher carried out some interesting investigations on sexual differences, although the results are not exactly comparable, since the boys and the girls were not in the same schools, and the girls were, moreover, of slightly higher social class than the boys. In description it was found that the boys dealt more with objects and their meanings and with definite numbers. They excelled the girls in practical characters of number, size, and use, but not so much in regard to spatial relations, or to number and size of persons, and to clothing. These German boys, nevertheless, paid more attention to clothing than the girls, apparently because of their interest in the uniforms of officials. The girls, though less concerned with detailed facts concerning objects, showed more interest in the emotional expression of people.[1] In the logical formation of sentences the girls (contrary to a common belief) proved superior to the boys. They also excelled the boys in rapidity of reading. In ability to read and write at the same time the girls were superior to the boys at an early age, but later there was no difference in this respect. The girls greatly excelled the boys in output; their descriptions and reports were of much greater extent. Their ready spontaneity corresponded to this greater output. In writing essays they excelled the boys in nearly every respect. The drawings of the girls also contained more than those of the boys, this being apparently due to better visual memory; they reproduced objects and colours more accurately than the boys. In literary style the girls also excelled the boys, surpassing them especially in the use of

[1] Heymans (*Psychologie der Frauen*, 136) also found that while men talk more of things women talk more of persons. He also found that in both sexes alike the unemotional talk more of things than the emotional, and the emotional more of persons than the unemotional. In this, and in other matters, there is, as Heymans puts it, a correlation between personality and emotionality.

metaphor and of picturesque adjectives. Blemishes exceeded good points in number in the essays of the boys, but it was the reverse in those of the girls, and the literary style of the girls was more lively. Above all they were richer in feeling, displaying more sympathy and more sentiment.[1] They were at the same time lacking in the loyal and ethical feelings shown by the boys, as also in the intellectual feeling of admiration. On the whole there was more personality in the literary work of the girls. They also seemed more visual than the boys, and were certainly more subjective.[2]

Ivanoff made an elaborate and ingenious study of intelligence in relation to ability in drawing among the boys and girls of the schools in the French-speaking cantons of Switzerland (Neuchâtel, Geneva, Vaud, Berne). He finds that there is a correlation between general aptitude for school work and aptitude for drawing. In general aptitude, however, the girls were slightly superior to the boys, while the boys were superior in drawing. Writing is a kind of drawing, and there was a correlation between good drawing and good writing, which was, however, rather better marked in the boys than in the girls. There was also a correlation between aptitude for geography and good drawing, but the boys showed more aptitude for geography than the girls. There was, again, a correlation between drawing and history, the boys here also being superior to the girls. There was an antagonism in the boys between drawing and languages (which Ivanoff believes may be an antagonism between the symbol and the reality), but it was not found in the girls. In arithmetic there was in the girls a correlation with drawing, but in the boys there was, on the contrary, an antagonism between aptitude for

[1] It may be noted that Heymans in Holland noted that girls are superior to boys in narrating stories of their own invention, and that their essays excel those of boys in imaginative detail. We have here a basis for the success of women as novelists.

[2] J. Cohn and J. Dieffenbacher, *Beihefte zur Zeitschrift für Angewandte Psychologie*, no. 2 (1911).

drawing and aptitude for arithmetic.[1] In the boys, on the other hand, there was a complete correlation between manual work and drawing, but only an incomplete correlation of this kind in the girls. No sexual difference was found in literary composition; there was a clear correlation between good drawing and good composition in both sexes, but there was no corresponding correlation between bad drawing and bad composition. There was a strong correlation between good drawing and intelligence. The proportion of intelligent scholars was almost the same in both sexes; there were, however, more unintelligent girls than boys. Girls were found to be slightly more attentive than boys and the proportion of inattentive boys was nearly twice as great as of inattentive girls. Good drawing is by no means correlated with attention; 26 per cent of the girls good in drawing were described as attentive, but only 14 per cent of the boys. Ivanoff found in this highly instructive study of sexual differences that though girls are more often unintelligent than boys, they more often stand well in their work; they are more diligent, they are more attentive. He concludes that girls are more influenced than boys by emotional influences having nothing to do with intelligence; they possess less 'function of abstraction' than boys, fewer abstract types of intelligence. There is a closer correlation in their case between good drawing and good all-round work, this showing a less degree of differentiation in their intelligence, though by no means necessarily a less rich psychic life. A boy can be very strong in one subject and very weak in another; this is rare in girls, who, however, by diligence are able to efface this lack of special aptitude. They resemble the tortoise who outran the hare. It is by this diligence, combined with the exercise on a great scale of their aptitude for memory, that girls are fully able to supplement any lack of special innate aptitude.[2]

[1] This same antagonism has been noted in draughtsmen of genius.

[2] E. Ivanoff, *Arch. de Psychol.*, Dec., 1908.

Memory, it will be seen, is found to be decidedly superior, on the whole, in girls. This accords with the opinion of most of the competent observers who recognise any sexual difference in this matter. Thus, in Holland Heymans found that only two professors regarded men as superior in memory, against eighteen who considered women superior, twenty-four noting no sexual difference.[1]

Various series of experiments have been made on memory in school children. Their tendency is to show a slightly greater superiority in girls, although this superiority is not found in every kind of memory. Thus in an elaborate series of experiments made by Max Lobsien on over 450 children at Kiel,[2] it was found that the total increase in memory power during school years was greater in the girls than in the boys; in girls there was a general development in all kinds of memory about the age of twelve, but this uniformity was not marked in boys; the memory of girls for sounds rose chiefly about the thirteenth year, and for visual representations about the fourteenth year. When a comparison is made between boys and girls of the age of ten to eleven, there is, on the whole, a very slight superiority of girls; between twelve and thirteen — when the precocity of girls comes into play — there is a decided superiority of girls, shown in six kinds of tests out of eight; at the final stage, between the ages of thirteen and fourteen and a half the superiority of girls has very slightly fallen, but is still shown in six tests. The memory for words and also for visual representations was decidedly better developed in the girls. In tests involving reproduction in exact succession boys were slightly superior as regards figures and sounds, but in the sphere of real objects the girls were decidedly superior. Some of these results correspond with those found by Monroe among American-born children in Massachusetts, between the

[1] Heymans, *Die Psychologie der Frauen*, 127.

[2] Max Lobsien, *Zt. f. Psych. u. Phys. d. Sinnesorgane*, Bd. 27, Heft 1 and 2 (1901). Vertes in Germany also found memory better in girls.

ages of 2 and 6. At all ages the girls were decidedly superior to the boys in remembering simple songs of the kindergarten type; altogether 50 per cent of the boys and 63 per cent of the girls remembering the songs. But the superiority of the girls is less marked at the higher age, though this is only 5 to 6 years, than at the early age. It may be added that Helen Thompson found that while women students memorise better, there was no sexual difference in retentiveness of memory.

It would be easy to add to the testimony in favour of the memory of women. Thus Pyle found a striking feminine advantage in memorising prose. Miss E. F. Mulhall found memory for words and syllables slightly higher in girls, though memory for forms slightly higher in boys; A. L. Gates at the University of California concluded that women show better than men in memory, though the men are superior in reasoning. Women were much more likely than men to make erroneous statements — one-third more — but they could correctly reproduce more of the details of a given group of facts than the men. In delayed memory also the women had a greater range and could reproduce more detail correctly, though here also they made more positive errors.[1] Aall, separately testing adults and children, always found females better than males in immediate reproduction, and so also with adults for delayed reproduction, but among the children the boys were superior in delayed reproduction. Cohn and Dieffenbacher found school-girls superior to boys in memory tests at all ages. It is the usual, though not invariable, rule. But when the tests involve reasoning power and judgment, the feminine superiority is no longer marked and often gives place to masculine superiority. It may be legitimate to point out that when white children are compared with coloured children, as Josiah Morse found at the University of South Carolina, the coloured children excel in memory, the white children in judgment and reasoning.

[1] A. L. Gates, *Psych. Rev.*, March, 1917.

The results of such inquiries would seem to indicate that there is a certain antagonism between memory and reasoning. By reliance on memory there is less need, apparently, to make a fatiguing appeal to reasoning; by reliance on reason it is felt to be possible to dispense with memory. In this matter the sex difference is small but it seems to be deeply rooted. Speaking generally, it may be said that, when difficulties are introduced, boys tend, as Lipmann's results show, to exhibit superiority; this is so even when manual tests have to be carried out with the unfamiliar left hand. Many boys, unlike almost all girls, tend already in their second year of life to play with mechanical instruments. So that we are here concerned not with an acquired but an innate impulse.[1] Cyril Burt also considers the difference innate. In testing boys and girls with questions which involved thinking out problems he found the average difference between the sexes 'extremely small,' in Infant's Schools no difference at all, a slight superiority of girls, owing to their precocity, at 6, but from 8 to 11 a slight superiority of boys which is 'probably an inherent sex difference.' At 12 the earlier prepubertal acceleration of girls gives them again a transient superiority. About the school-leaving age the superiority of boys is reasserted and increases progressively. Of environmental factors, Burt considers that teaching efficiency amounts to little, while the degree of freedom and independence accorded is the most powerful factor. The social environment, however, is important, since in Training Colleges where the women come from homes economically superior to that of the men they are also superior in intelligence.[2] Lipmann concluded from his wide survey that in all that can be comprehended under *technique* boys

[1] Spearman, *Abilities of Man*, 230. It must be added that later (p. 390), in referring to the superiority of boys in mechanical respects (educing spatial relations and correlates), he becomes doubtful as to its being really innate, though he does not attempt any other explanation.

[2] Cyril Burt, 'The Development of Reasoning in School Children,' *Jour. Exper. Ped.*, Dec., 1919.

are superior to girls, meaning thereby not so much skill with the hands as optical representative powers, imagination, ability to systematise, etc. In drawing boys are superior to girls, Lipmann concludes, this superiority being shown in representations involving some technical interest, while girls come out best where the interest is in persons rather than objects. The superiority of boys in arithmetical reasoning has been found by many investigators — the Presseys, Whipple, etc. — though not among very young children. Superiority in geometry is also sometimes ascribed to girls; but Spearman rightly points out that there is no ground for the popular habit of classing together arithmetic and geometry as a single 'mathematical' ability.

The only major sexual difference which Helen Thompson found among her working children was the great superiority of the boys in opening the Puzzle Box. McFarlane similarly found boys 'enormously superior' to girls in the Puzzle Box test, which accords with the superiority of boys in other spatial relationship tests.[1] Burt and Moore had previously found boys superior to girls in solving mechanical puzzles. Acher, in studying the spontaneous activities of children, gave much attention to the uses of string and found many sex differences. Though various uses were common to both sexes, by the age of 9 or 10 marked differences tended to rise, even in regard to the same forms, as knots. Boys want to tie hard knots and puzzle knots; girls are interested in the decorative aspect of knots. Boys are also much more interested in knives for sticking and cutting, while girls are interested in scissors.[2] Acher found that, though boys and girls are at first equally interested in throwing stones and other objects, this interest soon dies out in girls (though they retain a love of collecting stones); and Gulick regards the instinct of throwing stones as exclusively belonging to boys. The feminine indifference to the practice of stone-throwing,

[1] *Brit. Jour. Psych.*, 1925. [2] *Am. Jour. Psych.*, Jan., 1910.

with accompanying lack of skill, certainly becomes pronounced at a fairly early age and is by no means merely a modern habit of ladylike propriety, for it appears that Æneas Tacticus, who is supposed to have been a contemporary of Aristotle in the fourth century before Christ, has remarked: 'You can tell a woman by her throwing ever so far off.' But this trait is not quite immutable and girls have sometimes attained proficiency in cricket.

In an article by Stanley Hall on 'The Contents of Children's Minds on Entering School,' [1] a summary is given of an investigation carried on at Berlin into the ideas and knowledge of several thousand children on entering school. Although this investigation was left to the teachers, certain fairly reliable results seem to emerge. The familiarity of the children with 75 different objects and ideas was tested, and it was found that 'the easily and widely diffused concepts are commonest among girls, the harder and more special or exceptional ones are commonest among boys. The girls excelled in space concepts, and boys in numbers. Girls excelled in fairy tales, and boys in religious concepts. As the opportunities to learn both would not probably differ much, there seems here a difference of disposition. Rothkäppchen was better known than God, and Schneewittchen than Christ. More boys could repeat sentences said to them, or sing musical phrases sung to them, or sing a song, than girls.' Stanley Hall proceeded to give an account of a more careful study on similar lines of several hundred children at Boston. The results, although not carried out on a sufficient number of children, confirm on the whole those reached at Berlin. 'In 34 representative questions out of 49 the boys surpass the girls, as the German boys did in 75 per cent of the Berlin questions. The girls excel in knowledge of the parts of the body, home and family life, thunder, rainbows, in knowledge of square, circle, and triangle, but not in that of cube, sphere, and pyramid, which is harder and later. Their stories are more

[1] *Ped. Sem.*, June, 1891.

imaginative, while their knowledge of things outward and remote, their power to sing and articulate correctly from dictation, their acquaintance with numbers and animals, is distinctly less than that of the boys. The Berlin reports infer that the more common, near, or easy a notion is the more likely are the girls to excel the boys, and *vice versa*. . . . Boys do seem more likely than girls to be ignorant of common things right about them.' These data bear on the respective capacity of men and women for abstract thought and for practical life, which it will be necessary to touch on later.

One other series of observations may be mentioned. Professor C. S. Minot sent out cards with the following request: 'Please draw ten diagrams on this card, without receiving any suggestions from any other person, and add your name and address.' Five hundred sets were received from persons of both sexes. Circles were most common, then squares, then triangles, then four-sided figures, and so on. It was found that repetitions much predominated among the women, though this is not true of all classes of diagrams; the men exhibited on the whole much more variety than the women.[1]

Various investigations have shown a certain degree of sexual difference in the ideals and literary tastes of children. Thus Lobsien, at Kiel, found that girls have a much smaller range in their ideals, all sorts of persons being regarded by boys as their ideals.[2] In London, in 1926, the Borough Librarian of the Bethnal Green Library took a census among the boy and girl readers to find out their favourite books; no notice was given beforehand; 300 girls and 269 boys recorded their votes. The largest number of boys liked adventure stories (82 boys to 12 girls); the largest number of girls liked school stories (148 girls to 56 boys). Among other classes of books, boys preferred aërial adventures, historical stories (no girls), Red Indians

[1] C. S. Minot, *Proc. Am. Soc. for Psych. Research*, I, no. 4 (1889).
[2] Lobsien, *Zt. f. päd. Psych.*, 1903.

stories (no girls), sea stories (no girls); while girls preferred domestic stories (no boys), fairy tales, scout stories. More girls preferred standard novels (like those of Scott, Dickens, and Brontë), but more boys preferred serious non-fictional books.

In America Brittain has written a lengthy study founded on the tastes of children in matters of literature, and in the writing of stories. The boys specialise on motor interests, the girls are more static and emotional. The girls excel in visual and auditory imagery, the boys in motor imagery. The girls have a stronger interest in names and use fanciful and striking names more frequently. Their stories are more detailed, though the details are often irrelevant, and the emotional material (pity, sadness, fear, etc.) so large as to 'suggest almost a neurotic tendency.' At the same time the stories of the girls are often top-heavy with ridiculous climaxes. The boys excel in constructive unity. Religious and moral, as well as emotional, interests enter more largely into the girls' stories.[1]

The ideals of English school children have been investigated by Catherine Dodd by the method of asking two questions: (1) Would you rather be a man or a woman, and why? (2) What man or woman you have heard of would you rather be? These questions were put to 302 boys and 289 girls between the ages of eleven and thirteen, in the ordinary course of school work. (It may be noted that the South African War was going on at the time and this affected the answers.) 'Of the girls, 35 per cent wish to be men, and only one boy wishes to be a woman, and that only in order to live an easier life, most of the boys wishing to be Wellington or Nelson; 30 per cent girls wish to be women because they have ideals of helping and elevating the world, or would like to be nurses, etc. Florence Nightingale and Gladstone are the people the girls would oftenest like to be; another 30 per cent of the girls would like to be women in order to escape the re-

[1] Horace Brittain, *Ped. Sem.*, June, 1907.

sponsibilities of men's lives and get more joy out of life. Of the boys, seventy-six per cent wish to be men for purely selfish reasons, 15 per cent for more unselfish reasons. Some of the boys fairly put both sides of the question, but none of the girls do so. The boys usually want to be eminent soldiers or else Shakespeare or Gladstone.' [1]

The same questions were subsequently put to 196 German school children, in primary and secondary schools, between the ages of ten and fourteen. The German children were very grave and serious, and never showed the sly touches of humour, fancy, or rebellion found among the English children. The boys gave prominence to civic virtues, the girls to domestic virtues; the latter were also very docile in accepting ideals, and very sentimental. In striking contrast to the English girls, there was not a single German girl who wished to be a man; some said, 'It is wicked to wish to be a man'; only one girl desired to escape responsibilities. 'Unlike the English girls, also, they are much impressed by the importance of being good wives and mothers. On the whole they have a high sense of duty and none of the rebelliousness of spirit of the English girls. Of the boys, 54 per cent wish to be men in order to get more enjoyment. One German boy wishes to be a woman, because women can love better, and another because they are more ideal.' [2]

A further study presents the results of putting the same questions to 600 American boys and girls in the New England States and Indiana. 'The answers of the girls (unlike those of the German girls) are more interesting than those of the boys; 15 per cent of the girls wish to be men; they demand freedom and glory, and (unlike the German girls) only one refers to maternal duties. They admire the greatness of Washington and the wealth of Miss Helen Gould, Louisa Alcott coming third in their admirations. The heroes of the American girls are mostly women, and they show little of the adventurous spirit of the English

[1] Catherine Dodd, *Nat. Rev.*, Feb., 1900. [2] *Ibid.*, Dec., 1900.

girls.'[1] Another investigation at Nashville, Tennessee, showed that 9 per cent of the boys and 35 per cent of the girls chose ideals from the opposite sex.[2]

In Sweden the ideals of 474 boys and 425 girls in the common schools of Gothenburg have been investigated by Georg Brandell of Upsala University.[3] Up to the age of nine, both sexes most usually chose their parents as their ideals, the boy his father and the girl her mother. Teachers were not popular as ideals. Historical and public personages (usually Swedish) were chosen to a much greater extent than by English and German children, but less than by American children. The boys often chose characters from fiction and the girls from the Bible. Twice as many girls as boys would have liked to be God or Jesus. (In Edinburgh the proportion has been found higher, but maintains the same ratio, 7 per cent boys and 13 per cent girls wishing to be God or Jesus.) The Swedish girls chose men as ideals much more frequently than the boys chose women (48 per cent against 7 per cent), and not a single boy over twelve named a woman as his ideal. But among the girls the tendency to choose a masculine ideal increased with age, being twice as great at fifteen as at eight. Girls more than twice as often as boys assigned 'goodness' as the motive of their choice, though this tendency decreased with age. The Swedish children attached remarkably little value to material considerations, less than 1 per cent assigning wealth, etc., as the motive of choice, and only 2 per cent assigning values even to social position, unlike English and American children, who attach great importance to honour and position. The Swedish children placed intellectual and artistic qualities very high, 27 per cent boys and 40 per cent girls assigning them as motives of choice, a vastly greater proportion than is found either among English or American children. A moral standard

[1] Catherine Dodd, *ibid.*, June, 1901.
[2] D. S. Hill, *Ped. Sem.*, June, 1911.
[3] Summarised in *Ped. Sem.*, March, 1913.

of value was at all ages employed more often by girls than by boys. On the whole there was more variety in points of view among the girls than among the boys.

In this connection may be mentioned an inquiry by Monroe among 1800 boys and girls, aged 8 to 16, in Massachusetts, as to what they would like to be when grown up. It was found that 4 per cent of the boys and as many as 43 per cent of the girls wished to be teachers, this wish tending to decrease at the higher ages; 21 per cent of the boys and 8 per cent of the girls wished to be clergymen, doctors or lawyers; although most of their parents were manual or domestic workers, only about 6 per cent of these boys and girls wished to take up similar occupations themselves; 32 per cent of the boys and nearly as many of the girls desired to enter some business, trade, or clerical occupation. To Monroe's great astonishment, not one of these 900 schoolgirls, between the ages of 8 and 16, mentioned marriage as a desired vocation, although marriage was given by four boys as the occupation of their future lives. When asked the reason of their choice, 30 per cent boys and 44 per cent girls said it was because they liked it; 44 per cent boys and nearly 24 per cent girls assigned money as the reason of their preference, this motive increasing with age in boys, and decreasing in girls. Willard among Californian children found that money comes at the head of motives for selecting a vocation.[1] Monroe is inclined to think that money occupies an unduly high place in the ideals of American children. A desire to make the world better was assigned by only 6 per cent of the boys and 9 per cent of the girls.[2]

RAPIDITY OF PERCEPTION

This is an interesting example of a characteristic nearly always attributed to women, but not demonstrated in any

[1] W. S. Monroe, *Die Entwickelung des Sozialen Bewusstseins der Kinder* (Berlin, 1899); also *Am. Jour. of Education*, 18 June, 1896.

[2] *Studies in Education*, Stanford University, 1896–97.

satisfactory manner. It cannot, however, be entirely passed over. We must for the most part speak of it as complicated with various motor and intellectual processes such as have been in part already discussed.

Reaction-time merely indicates the more or less rapid manner in which a person responds muscularly to a signal. It is in more complicated processes, involving a larger element of intelligence, that we may perhaps expect to find more marked sexual differences. Romanes once tested rapidity in reading; the same paragraph was presented to various well-educated persons, and they were asked to read it as rapidly as they could, ten seconds being allowed for twenty lines. As soon as the time was up the paragraph was removed, and the reader immediately wrote down all that he or she could remember of it. It was found that women were usually more successful than men in this test. Not only were they able to read more quickly than the men, but they were able to give a better account of the paragraph as a whole. One lady, for instance, could read exactly four times as fast as her husband, and even then give a better account than he of that small portion of the paragraph he had alone been able to read. But it was found that this rapidity was no proof of intellectual power, and some of the slowest readers were highly distinguished men.[1] In youth we read rapidly, but it is within the experience of many of us that on reaching adult age we come to read more and more slowly. It is as though in early age every statement were admitted immediately and without inspection to fill the vacant chamber of the mind, while in adult age every statement undergoes an instinctive process of cross-examination; every new fact seems to stir up the accumulated stores of facts among which it intrudes, and so impedes rapidity of mental action. It is the same with the impulse to action; in the simply organised mind this is direct and immediate; 'I do just what I think of,' said to

[1] G. J. Romanes, 'Mental Differences between Men and Women,' *Nineteenth Century*, May, 1887.

Mendel an imbecile who had committed an offence against morality; 'afterwards I consider it.' In the more highly organised brain the consideration comes before the action and retards or inhibits it. We may say that the impulse and the action form the two ends of a circuit which at the middle of its course is intellectual. The longer and more enfolded the intellectual portion of the circuit the longer it will be before the impulse is transmitted into action.

The masculine method of thought is said to be massive and deliberate, the feminine method quick to perceive and nimble to act. The latter method is apt to fall into error, but is agile in retrieving an error, and under many circumstances this agility is the prime requirement. Whenever a man and a woman are found under compromising circumstances it is nearly always the woman who with ready wit audaciously retrieves the situation. Everyone is acquainted with instances from life or from history of women whose quick and cunning ruses have saved lover or husband or child. It is unnecessary to insist on this quality, which in its finest forms is called tactfulness.

In its less refined form it is called lying. It is commonly said that lying is more common in the feminine sex but that belief is not accepted by all. Thus Dr. Franzeszka Baumgarten could find no marked sex difference among children in the amount of lying although a difference in the motive, in girls more frequently to obtain dainties and in boys to obtain small sums of money to buy fireworks, etc. She agrees with Drommard that 'hypocrisy is not the characteristic of a sex but of the weak in their struggle against the strong.' [1] This is certainly correct, but it would alone lead us to expect a greater feminine frequency of lying. In an elaborate study of the extreme form of lying ('pathological lying'), William and Mary Healy in Chicago found that nearly all cases were in girls. The tendency begins in childhood; the subjects are mentally normal, though often under the influence of emotional strain, and

[1] *Beiheft zur Zt. f. Angewand. Psych.*, 1917.

the proportion is eighteen females to one male. There are several social and psychological reasons, the authors observe, for females to deviate from truth more readily than males. Some observers have increased the proportions of males by mixing together the mentally abnormal with 'pathological liars proper.' Borderland cases are often males and mentally abnormal swindlers are largely males as males here have vastly greater opportunities. We must not too hastily judge the larger proportion of female liars as entirely the expression of innate characteristics.[1]

The method of attaining results by ruses (common among all the weaker lower animals) is so habitual among women as to be according to Lombroso and Ferrero 'almost physiological.' Diderot somewhere says that the one thing women have been thoroughly well taught is to wear decently the fig-leaf they inherited from their grandmother Eve. The same idea is more coarsely and ungraciously stated in the proverbs of many nations, and in some countries it has led to the legal testimony of women being placed on a lower footing than that of men. But to regard the caution and indirectness of women as due to innate wickedness, it need scarcely be said, would be irrational. It is inevitable, and results from the constitution of women, acting in the conditions under which they are generally placed. Women have lied because men have bullied. 'Excess of moral suppleness,' said Manouvrier, is a quality of women, in which 'the brutal male finds the satisfaction, yet so often illusory, of his authoritarian instinct.' There has seldom been any civilised society in which a woman may safely state openly her wishes and desires, and proceed openly to seek their satisfaction.

Lombroso and Ferrero analysed this habit of mind—writing, it must be remembered, nearly forty years ago—and they traced it to seven causes, which all act chiefly or exclusively on women: (1) *Weakness.* For cunning and deception are the necessary resort of the weak and op-

[1] W. and M. Healy, *Pathological Lying* (1916).

pressed; only the strong can afford to be frank. (2) *Menstruation.* This function is treated with a certain amount of disgust, therefore women try to conceal it; so that every month they are exercised in dissimulation for three or four days, during which they either endeavour to conceal their condition altogether, or else simulate some trivial malady. (3) *Modesty.* Thus in a woman any demonstration of love which has not been invited by a man is regarded as immodest, whence a training in deception which in the excitable nervous systems of women is peculiarly severe; again, in women the exercise of the natural functions of urination and defecation have been regarded as immodest, so that any natural call of this kind must either be repressed, or some ingenious ruse must be invented in order to gain an opportunity for its satisfaction; the facts concerning sexual relationships, again, are also regarded as immodest, and are so far as possible concealed from women and girls; so when they find them out, they have become habituated to the idea that to be modest means telling lies about such things, and they continue the tradition. (4) *Sexual selection.* A woman instinctively hides her defects, her disorders, if necessary her age — anything which may injure her in the eyes of men, including even her best qualities, if she thinks that these may call out ridicule or dislike. A woman usually finds it easy to mould herself on the ideal of the man she is with at the moment, provided she admires him. He might be repelled if she were independently to assert her own individuality. The artifices of the toilet have the same source, although, as has often been pointed out, they no longer refer to men alone, but are also intended to impress other women, or to obtain a triumph over them. (5) *The desire to be interesting*, leading to simulated weaknesses, etc., and a supposed need for protection; this seems to be merely an extension of the previous heading. (6) *Suggestibility.* The greater suggestibility of women necessarily involves an overlapping of the real and the simulated — which is really unconscious

and involuntary. (7) *The duties of maternity.* A large part of the education of the infantile mind at the hands of mothers consists of a series of more or less skilful lies, told with the object of hiding from children the facts of life which are not considered proper or right for them to know; frequently also various false ideas are taught in order to frighten or otherwise influence children; so that in training their children women are also training themselves in dissimulation.[1] I think it might be added that another cause of dissimulation lies in their compassion, a feminine quality on which Lombroso and Ferrero elsewhere rightly insist; an exaggerated desire to avoid hurting or shocking others is one of the most frequent causes of minor dissimulations, and works more powerfully in women than in men. I would also add that this tendency to caution and ruse is by no means confined to the human female; it appears to be a fact of considerable zoölogical extension, and is rooted in the necessity the female is under of guarding her offspring from danger.[2] Female monkeys are more cautious and cunning than the males, and it is said that trappers on the average can only catch one nursing and three or four females of any kind for two score specimens of the less wary sex.

Klages, in his study of handwriting and character, finds that 'veracity' is a characteristic of women. In commenting on the apparent opposition of this conclusion to the almost proverbial ascription to women of mastery in lying, he remarks that the necessity to resort to lying and cunning is the natural result of physical weakness, but that mendacity is quite distinct from inner veracity. 'One may be skilful in lying while preserving inner veracity, and one may be diligent in external truthfulness without even having strength and courage for the self-acknowledgment of one's own impulses.' Self-deception of this kind is com-

[1] Lombroso and Ferrero, *La Donna Delinquente* (1893), 133–39.

[2] See, e.g., 'Les Ruses Maternelles chez les Animaux,' *Rev. Sci.* (1901), 80–84.

mon in men, and Klages refers to the frequency with which Ibsen made such masculine self-deception the subject of his dramas.[1]

It will thus be seen that the 'deceptiveness and dissimulation' of women must not be confused with untruthfulness. It is certainly the fact that many ancient proverbs in various countries attribute to women an unqualified tendency to falsehood. But more careful observations today show that in the ordinary affairs of life, in which their own emotional tendencies are little called in question, women are quite equal, and perhaps superior, to men in devotion to truth. This result clearly emerges from the *enquêtes* of Heymans, which showed that 65 per cent women, as against 63 per cent men, were regarded as completely trustworthy; while among school children, only 1.3 per cent girls, as against 5.5 per cent boys, were 'deliberate liars.' On the whole the younger generation of women were found more truthful than the older generation, and Heymans considers it probable that modern social conditions, allowing greater liberty and independence to women, have been favourable to the development of feminine truthfulness.[2]

Buckle dignified the ready wit of woman by terming it a tendency to start from ideas rather than from the patient collection of facts: men's minds, he asserted, are naturally inductive, women's deductive.[3] It would perhaps be more correct to say that women start more readily, without any conscious intellectual process, from the immediate fact before them. It is unquestionably a valuable aptitude, and, as Buckle remarks, women's fine and nimble minds are no doubt often irretrievably injured by 'that preposterous system called their education.' He refers to the notable superiority of women in quickness of intelligence among

[1] L. Klages, *Handschrift und Character*, 165.

[2] Heymans, *Psychologie der Frauen*, 251 *et seq.*

[3] 'The Influence of Women on the Progress of Knowledge,' Buckle's *Miscellaneous Works*, I,

the lower classes, and to the fact that a stranger in a foreign land will always find that his difficulties are more readily understood by women. In America Bridges and Coler as well as Yerkes, agree with Binet in France and Hoffmann in Germany that there is a considerable dependence of intelligence upon sociological conditions and that the correlation is higher for boys than for girls, so that, while the boys of superior class are noticeably superior to the girls, the girls of the poorer class are superior to the boys.[1]

I think there can be little doubt as to the more ready intelligence of women among the uncultivated classes. In the working class the occupation of the men generally confines their intelligence within a limited field, and is unfavourable to readiness and flexibility of mind. But the women of the same class, with the varied cares of the family, and manifold avocations in the house and in the street, bringing them into contact with all sorts of people, tend to acquire that readiness and flexibility which their husbands lack, and a resulting superiority of general intelligence.[2] Even in the solitude of the Australian bush, I have noted that while the settler may be embarrassed and silent, or scarcely able to utter more than monosyllables, his wife is comparatively fluent and in possession of a fairly rich and precise vocabulary. It would appear that this fluency of speech is more than merely the result of greater practice in the course of domestic avocations, for Fehling states that the little girl's command of speech is superior to the little boy's at a very early age, and women are seldom liable to stammer.[3] It may be added that Waldeyer

[1] *Psych. Rev.*, Jan., 1917.

[2] Dr. Catharina van Tussenbroek (*Over de Equivalentie van Man en Vrow*, 1898, p. 7), who considers that in the higher social classes the men are superior to the women, well emphasises the reasons why in the lower classes the women are superior. It appears that Joubert had long since remarked on the superiority of women in the lower class and of men in the higher class; but he attributed this to the natural possession by women of virtues of a conservative and prudential kind, which are advantageous under conditions of working-class life, but disadvantageous under better social conditions.

[3] Men are three times more liable to this defect, according to Ssikorski. Hartwell found that among Boston school children, the exact proportion of

has found that woman's greater skill in the use of the tongue is associated with greater muscular strength of this organ, even absolutely. Marro found that among school children the only active class of faults that prevails more among girls than boys is sins of the tongue; otherwise, the faults of girls were mainly passive. It may be said that facility of apprehension has been generally recognised in women. An eminent physician, Currie, mentions (according to Buckle) that when a labourer and his wife came to consult him it was always from the woman that he gained the clearest and most precise information, the intellect of the man moving too slowly for his purpose. This is by no means an uncommon medical experience. It appears also that Parisian lawyers have discovered that women can explain things best, and they say to their working-class clients, 'Send me your wife.'

PRECOCITY

It is an interesting fact, and perhaps of some significance, that among primitive races in all parts of the world the children are precocious in intelligence. Alike among the Eskimo and among the Australians it has been noted that the aboriginal child is sometimes quicker in learning than the white child, but his progress soon stops short. Among the African Fantis, Lord Wolseley remarked: 'The boy is far brighter, quicker, and cleverer than the man. You can apparently teach the boy anything until he reaches puberty, then he becomes gradually duller and more stupid, more lazy, and more useless every day.' Kaffir lads, also, Galton was told, are often ahead of white boys in the early stages of education, but the limits of their development are soon reached. Among the lower yellow races the same phenomenon is witnessed. Thus Leclère, in his study of the Cambodgians, found that the children are very in-

stutterers was 1.12 per cent of all boys and .42 per cent of all girls. Chervin states that the proportion of female to male stutterers is only 1 to 10. The proverbs of many nations bear witness to women's facility of speech.

telligent when young, but that at the age of fifteen they become stationary and less active; a certain obscurity — *un peu de nuit* — comes on their minds, and at the same time their features become less regular and beautiful than they were before. It seems that the lower the race the more marked is this precocity and its arrest at puberty. It is a fact that must be taken in connection with the peculiarly human characters of the youthful anthropoid apes and their more degraded morphological characters as they grow older.

Among the civilised European races precocity of intelligence, speaking generally, is not a fact of good augury for intelligence in after-life. This statement is scarcely qualified by the fact that among persons of abnormal intellect, or genius, extraordinary precocity is sometimes found. The average results of precocity on after-development cannot at present be definitely stated as regards intelligence, but appear more clearly in other fields which are more easily open to exact observation. Thus Galton, considering the results of certain tables of the height of the male population which he had prepared, and which appear in the Report of the Anthropometric Committee of the British Association (1881), remarked: 'Precocity is, on the whole, of no advantage in later life, and it may be a disadvantage. It is certain that the precocious portion do not maintain their lead to the full extent; it is possible that they may actually fall back, and that many of those who occupied a low place in the statistical series between the ages of 14 and 16 occupy a high place after those years.'

Rousseau long ago said in *Émile* that girls are more precocious in intelligence than boys. This is in harmony with what we know of the physical development of the sexes. Thus Delaunay remarked that, among children under the age of twelve, teachers in mixed schools find that girls are cleverer than boys. Bellei, again, in Italy found that school-girls of an average age of nearly twelve years were more developed mentally than boys of the same

class, and nearly the same age. Shaw, also, in investigating memory in school children, found that the chief difference was the greater precocity of the development of memory power in girls. Among 1000 Washington school children, Macdonald's data showed that on the whole the girls are at the usual school age ahead of the boys; in average ability the girls were superior in nine studies, inferior in four, and equal in one. On the subjective side, also, Ruediger found among American teachers and students that the period of mental reconstruction and intellectual maturity occurs in men on the average at 22.2 years, with a median of 21 years, and in women on the average of 20.25 years with a median of 19.5 years. The precocity of girls seems to extend beyond the school age; in America Scott Thomas found that young women graduate at an earlier age than young men in the same college. At the other extreme girls are more precocious than boys even at kindergarten age. In one American series tested the median for girls was five points higher than for boys though (as often happens) the highest subject was a boy. The average superiority of girls is often slight, but Terman has found it constant.[1] In London, in 1925, Miss F. A. Wood reported to the Elementary Education Sub-Committee of the London County Council that among over 2000 children of the age of seven, tested orally or in writing or both ways, the power to comprehend what was read gave an average score of 7.4 (out of a possible 10) for girls against 7 for boys; in arithmetic, whether written or oral, there was a similar regular superiority of the girls. It is noteworthy that there was found to be a decided improvement on the norms established a few years previously. It seems possible that the improved physical growth noted in recent years is accompanied by improved mental growth.

It is now recognised that the question of age is complicated because there are numerous systems of the individual's experience to which it may apply and these may run

[1] L. M. Terman, *The Intelligence of School Children* (1921), 35.

at different rates, so that the estimate of 'precocity' becomes vague. For the purpose of psycho-educational analysis we may recognise as many as five different ages: a *chronological age* in years, referring to the temporal length of life; a *physiological age* indicating the stage of physical growth and maturity reached; a *mental age* indicating the instinctual and intellectual capacities exhibited; a *pedagogical age* corresponding to the school position; and a *moral age*, marked by the stage of emotional and social development attained. In an ideally normal individual we may suppose that all these various ages would run concurrently, but in general practice they do not tend to run at the same rate. There are also differences in the sexual patterns. Thus Terman found that the early superiority of girls is maintained in school life, and that even when chronological age, mental age, and I.Q. (that is to say, the Intelligence Quotient or ratio of mental age to chronological age) are almost exactly the same, the girls had the advantage. Moreover, girls of average intelligence (unlike boys) do better than average school work, probably because they are more willing and submissive and industrious. There may also be an important relation of difference, as Bird Baldwin has pointed out, between physiological age and pedagogical age. He found among 2000 boys and girls of New York and Chicago, averaging very high in weight, height, and lung capacity, and with the girls maintaining a higher school average than the boys, that the pupils who are short and light in weight tend, although often precocious in brightness, to be immature in mental development. This would require tall, healthy children of accelerated physiological age to be encouraged to proceed rapidly, and the children of retarded physiological development to be held back, the consideration of physiological age and mental age taking precedence of chronological age.[1]

We must not hasten to conclude that the precocity of

[1] Bird Baldwin, *Pop. Sci. Monthly*, Dec., 1914.

girls, with their earlier arrest of development, necessarily involves a pronounced ultimate superiority of the male. An investigation made by Professor Thorndike and associates at Columbia University led to the conclusion that the doctrine of an eventual male superiority delayed until the late teens by male delay in maturity must be moderate in its quantitative claims. The inherent male superiority between the ages of 15 and 19, if it exists at all, is small in comparison with the differences within either sex.[1]

Mead, in 1916, found that among normal children girls used words appropriately a month earlier than boys, and among the feeble-minded two months earlier. Terman found a similar superiority of girls in beginning to speak. Miss M. E. Smith at Iowa University found indeed among children of pre-school age no consistent sex differences; but McCarthy at Minnesota University found a superiority of girls in sentence formation from the age of eighteen months.

This greater verbal mastery continues to be shown by girls at a late age. Burt finds that girls excel in patient analysis, attention to details, picturing definite situations, and above all by their rapidity in extracting meaning and formulating it into words; while boys are more methodical, more critical, more logical, less wordy and more resistant to suggestion. These are qualities which — Spearman would say — are due to the greater 'perseveration' of the male. Concordant results were reached by Ethel M. King and J. Ridley Thompson in Sheffield. Some 1500 boys and girls in an examination for admission to Secondary schools were told to write a sentence of five lines beginning 'Jack awoke' and to describe 'a picturesque awakening.' Mere domestic routine was the subject of the largest group of answers — about a quarter of the girls and nearly a fifth of the boys; it was in the imaginative and fairyland answers that the girls most outdistanced the boys — 13.3 per cent girls to only 4.5 per cent boys — while adventure, capture, and imprisonment had a larger place in the boys' answers.[2]

[1] *Ped. Sem.*, 1926, p. 167. [2] *Jour. Exper. Ped.*, Dec., 1920.

Results of some interest in reference to sexual differences in intelligence and character might be obtained by the cautious use of school-records. Something has already been done in this direction. Roussel, for instance, compared the punishments received by boys and girls at Belgian reformatory schools. He found that out of 100 boys, 9 or 10 are punished for pilfering; out of 100 girls not one; out of 100 boys, 54 are punished for quarrelling and striking; out of 100 girls only 17. On the other hand, he found that girls are more idle than boys in the proportion of 21 girls to 2 boys. On the whole, 31 per cent of the boys were punished, 26 per cent of the girls.[1] Riccardi found from an examination of several hundred school children of Modena and Bologna that girls had a greater fondness for study than boys and also a greater fondness for manual work, while the number of boys without any preference is much greater than of girls. He considered that women have greater educability, sociability, domesticity, diligence, and a more profound psychic atavism than men.[2] It is not until after the age of sixteen that the intellectual superiority of boys asserts itself. It will be seen that Riccardi's results do not seem to accord with Roussel's as to the frequency of idleness among girls, and it must be remembered that in the latter case we are dealing with an abnormal class. In the high schools of Finland, where co-education has existed since 1883, the girls obtain better marks throughout, and are impartially diligent, criticising nothing, while the boys are more critical and show inclination for special subjects.[3] Heymans, who has brought together the opinions of 74 Dutch professors on detailed points, presents results which may probably be regarded as of general application. At the universities it was found that 90.8 per cent of the women stood well in the examinations, as against 81.4 of the men; 7.3 of the women passed

[1] T. Roussel, *Enquête sur les Orphelinats*, etc., 1881.
[2] Riccardi, *Antropologia e Pedagogia*, Part I (1891), 121, 161.
[3] Leo Burgerstein, *Ped. Sem.*, 1910.

'*cum laude*' as against 6.3 of the men. In the State examinations (which included the medical faculty) 85.9 of the women stood well against 73.9 per cent of the men. (These results held good in all respects, taken separately, for the universities of Leyden, Utrecht, and Amsterdam, but not for Groningen, where the men came out conspicuously better than the women.) In all respects where the moral qualities of duty, diligence, and application came into play, the opinions of the professors tended to support the more precise results revealed by the examinations. Women show more zeal and patience; they are much more constant in attendance at lectures, more regular in study, more willing to take advice, more conscientious; they possess better memories.[1] In memory and in the moral qualities required for study women tend to excel men, and this combination of qualities counts for much in the attainment of success in our educational systems.

It would appear from various series of observations that in both sexes the onset of puberty has a very considerable effect in modifying, heightening, or depressing mental activities. It may not be out of place to refer here to its marked influence on conduct. This is clearly seen in the investigations made by Marro in North Italy.[2] The value of Marro's observations is due to the fact that in both boys and girls he distinguishes between those who did and did not show the signs of puberty. Considering age alone, he found that there is a descent from the age of 11, when conduct is good, to 14, when it is at its worst; after that age there is a steady and unbroken rise up to the age of 18. It was found that at the ages of 13 and 14 the conduct of those boys who had reached puberty was worse than that of those who had not; in the two following years, however, the reverse was the case, so that it would appear that delayed puberty is associated with tendencies to bad or

[1] Heymans, *Psychologie der Frauen*, 124 *et seq.*

[2] Marro, *La Puberté*, 67 *et seq.* The 'pubescent dip,' between 12 and 15, is considered by Karl Pearson, 'Relationship of Mind and Body,' *Annals of Eugenics*, I, 1926.

abnormal conduct. In the well-nourished classes it was found that the period of bad conduct was reached sooner than in the lower classes. Among girls, also, it was found that good conduct was much more constant before the first appearance of menstruation, after which conduct was very variable, being at its worst at the ages of 14 and 15, when it began to improve steadily. The maximum of bad conduct in women, Marro remarks, would appear to be associated with the maximum of physical development and the appearance of menstruation, and so to be dependent partly on increased nutritive assimilation and partly on sexual nervous disturbance. Irregularity of conduct at this epoch is, however, less marked in girls than in boys.

INDUSTRIAL AND BUSINESS CAPACITIES

The gradual opening up of various occupations has caused many practical experiments to be made concerning sexual differences in business capacity, though it can scarcely be said that the results have been very accurately observed and recorded. It must be added also that it is by no means easy to find men and women doing the same work under the same conditions; a process of sexual differentiation seems to come immediately into operation by which the women are enabled to do lighter work under easier conditions; this is so even in the Post-office, where a large number of women are employed.

Delaunay consulted a number of merchants concerning sexual differences in industrial occupations, and they generally agreed that 'women are more industrious but less intelligent than men'; thus in printing establishments, for instance, women were found to work mechanically with minute attention to detail, but without fully understanding what they were doing, so that they composed very well from printed copy, but not so well from manuscript as men.[1] Sidney Webb remarks that the Prudential Life Assurance Company employs considerably over 200

[1] *Revue Scientifique*, 1881, p. 307.

ladies in routine clerical work (copying letters, filling up forms, etc.). 'This work they perform, I am assured, rather better and more rapidly than men. But they are absent from sickness (usually only slight indisposition) more than twice as much as the men.' Moreover, it has been found impossible to entrust them with more than routine work, which is a drawback to their advantageousness to the employer.[1] In routine work, however — that is to say, continuous work at a low pressure — it is probable that they are superior to men, possessing thus greater application and patience; this seems a characteristic of the work of both civilised and uncivilised women.

It seemed to me some years ago a matter of interest to ascertain the experiences of the British Post-office, so large an employer of both men and women, as to sexual differences in capacity. It is not possible to obtain such information in a definite and precise form. But I received from an authoritative source a number of opinions which represent the experience of various large post-offices in different parts of the kingdom, and are regarded as being typical and reliable. Thus, one of the chief postmasters is of opinion that as counter and instrumental clerks, doing concurrently money order and savings-bank duties, taking in telegrams, and signalling and receiving telegrams, and in attending to rough and illiterate persons, women clerks are preferable to men. They keep their stocks in neater order, and are more careful with money; they speak better, as a rule, and are more patient. In another district where the telegraph work is entirely performed by women, it is stated to be admirably done. At a large provincial office it is found that women compare favourably with telegraphists of the other sex, doing their work, as a rule, with equal intelligence and accuracy. But it is found that they rarely exhibit the same desire as men to obtain a technical knowledge of telegraphy. Complaints from the public of inattention and incivility are less frequent in the case of

[1] S. Webb, *Economic Journal*, 1891, p. 635.

offices where women are employed; and women keep their stamp stocks in better order, are less troublesome in matters of discipline, and are regarded as less liable to go wrong in money matters than men. But at times of pressure they are not able to maintain a competition with men at the heavier kinds of work, owing to a lack of staying power. Another report also expresses doubt as to the strength and staying power of women for the continuous work of a heavy head-office counter, and male assistance has been required. As a general rule, in the opinion of another postmaster, female telegraphists perform counter duties satisfactorily, but in cases of emergency they are not equal to male officers, and the proportion of errors is generally greater among females than males. Men are also found better able to maintain discipline among the messengers. As regards instrument-room duties, women work moderately busy circuits just as well as men, but it is necessary to staff the busiest circuits with male telegraphists; this applies particularly to news wires, the work being too heavy for women, who do not seem to possess the wrist power required. Moreover, men are better informed on topics of general public interest, which is an element of importance in dealing with news traffic. According to another opinion, finally, women evince no desire to acquire technical knowledge.

There appears to be general agreement that women are more docile and amenable to discipline; that they do light work equally well; that they are steadier in some respects; but that, on the other hand, they are often absent on account of slight indisposition, they break down sooner under strain (although consideration is shown them in the matter of hours, etc.), and exhibit less intelligence outside the ordinary routine, not showing the same ability or willingness (possibly because they look forward to marriage) to acquire technical knowledge. These results seem to coincide fairly with those obtained from other sources.

The employment of women in the post-office is much cheaper (by about 25 per cent) than that of men, but from

the official point of view it is attended by various disadvantages: (1) They are much more frequently absent on account of sickness. (2) They are not required to work at night, and it is at night that a large part of the work is done. (3) They cannot do much overtime work, and at Christmas, etc., there is great additional pressure. (4) In offices where women are employed it is necessary to have the presence of a man during part of the day to afford protection in case of an attempt at robbery. When women are substituted for men an office worked by three or four men will require four or five women, chiefly, it seems, because it is not considered safe to leave a woman alone at any time. (5) The provision of separate lavatories, etc., for women is expensive and often, for want of space, impracticable. The last reason, more perhaps than any other, has militated against the immediate employment of women in provincial offices generally.

It is of interest to find that the experience of the post-office in England is confirmed by the experience of other European countries. In the post-offices of France, Germany, Austria, Italy, Belgium, Sweden, Roumania, etc., almost exactly the same characteristic advantages and disadvantages of women's work are experienced, as appeared from an investigation made some years ago by Mr. C. H. Garland, Secretary of the Postal Telegraph Clerks' Association. On the whole, however, it seemed that the English women, perhaps on account of the greater freedom of English life, compared favourably with their Continental sisters.

Many observations were made during the Great War on the advantages and disadvantages of women's work, though here, it must be remembered, women were handicapped by the novelty of the work they frequently undertook. As clerks many women were found by employers to perform a prodigious amount of work, while their quickness and receptiveness made it possible for them to attain skill and dexterity with marvellous ease. But, notwith-

standing these characteristics, it was usually found that the feminine output as a whole fell lamentably short of that of the men. The woman clerk, it was sometimes said, is 'a laggard at heart,' and disinclined to work up to her full powers, whether from defective interest or defective honour, and it required three women to do the work of two men. In lower spheres of work, such as tramway and motor omnibus undertakings, it was found that attendance was often irregular, and that a large number of female employees stayed only a short time.[1] That irregularity is no doubt largely associated with the inferior reserve of strength which often seems to characterise women, as witnessed by their greater tendency to minor illness (quite apart from menstrual periodicity), their less ability than men to stand long hours of work, and their more pronounced tendency to suffer from night work. 'What is a physical tax on man,' as F. S. Lee puts it, 'is a physical surtax on woman.'

Sidney Webb, who has studied some of the points touched on in this section, although from an economic rather than a psychological standpoint, reaches the following conclusions: 'The attraction to the employer of women's labour is often less in its actual cheapness than in its "docility" and want of combination. "Women strike less," says one. A similar fact is recorded as to the employment of the Negro in manufacturing industries in the "New South" (United States). . . . I find it difficult to draw any general conclusion from the foregoing facts. But they suggest to me that the frequent inferiority of women's earnings in manual work is due, in the main, to a general but not invariable inferiority of productive power, usually in quantity, sometimes in quality, and nearly always in nett advantageousness to the employer. . . . The problem of the inequality of wages is one of great plurality of

[1] The effect of the War on women's work in England was studied by Miss B. L. Hutchins, *Women in Modern Industry* (1916); and as regards America by F. S. Lee, *The Human Machine and Industrial Efficiency* (1918).

causes and intermixture of effects, and one might not improbably find that, as is often the case, there is no special women's question in the matter.' [1]

ABSTRACT THOUGHT

It is easier to compare the higher and more exceptional intellectual qualities of men and women than their average mental qualities, although in both cases we have the same difficulty — which cannot at present be definitely resolved — in determining precisely the boundary between organic constitution and education.

It is doubtless in accordance with what Buckle termed the special deductive bent of their mind that in science it has always been in the mathematical field that women have attained the highest amount of success.[2] This has been the case for some centuries past.

There is no such thing, however — one cannot too often repeat it — as pure rationality. The thought that we call abstract has its foundation in the organic and emotional character of the individual. Abstract thought in women seems usually, on the whole, to be marked by a certain docility and receptiveness. Even in trivial matters the average woman more easily accepts statements and opinions than a man, and in more serious matters she may even be prepared to die for a statement or an opinion, provided it is uttered with such authority and unction that her emotional nature is sufficiently thrilled.[3] This is allied with woman's suggestibility, and it seems to have to some extent an organic basis, so that while the culture of the more abstract powers of thought may make it impossible to obey

[1] Sidney Webb, *Economic Journal*, 1891.

[2] Possibly there is some connection between this fact and the fact — if we may so regard it — that mathematicians tend to show more admiration for the intelligence of women than do men belonging to any other branch of science.

[3] Thus Ruediger (*Am. Jour. Psych.*, July, 1907) found that personalities formed nearly one-half (45.4) of the influences mentioned by women as affecting their mental reconstruction in adolescent or adult life, while they only amounted to 35 per cent in the case of men.

this instinct, there is still a struggle; or else the more purely rational method is attained — and often distorted in the attaining — by the complete suppression of the other elements. 'The normal child feels the heroism of the unaccountable instinct of self-sacrifice,' said Stanley Hall, 'far earlier and more keenly than it can appreciate the sublimity of truth.' [1] In this respect women often remain children, and that they do seems to result from the organic facts of women's life.[2] I think we may agree that, as Burdach said long ago, 'Women take truth as they find it, while men want to create truth.' The latter method leads further, if only further into error. It is not simply that women are more ready than men to accept what is already accepted and what is most in accordance with appearance [3] — and that we could not easily imagine a woman devising the Copernican system — but they are less able than men to stand alone. It is difficult to recall examples of women who have patiently and slowly fought their way at once to perfection and to fame in the face of indifference, like a Wagner or an Ibsen — apart from the fact that a woman of talent is usually in more command of her means and able to reach a certain degree of success at an early period. It is still more difficult to recall a woman who for any abstract intellectual end has fought her way to success

[1] 'Children's Lies,' *Am. Jour. Psych.*, Jan., 1890.

[2] There are far more women than men who can say with Mrs. Besant: 'Looking back to-day over my life I see that its key-note — through all the blunders and the blind mistakes and clumsy follies — has been this longing for sacrifice to something felt as greater than the self.' (*Autobiography*, XIV.) While the instinct of self-sacrifice is common among women, it cannot be said that the appreciation of 'the sublimity of truth' is a masculine characteristic to anything like a corresponding degree.

[3] The influence of education must here be taken into account; women are trained to accept conventional standards. Thus an investigation (by Stanley Hall) of American children as to their ideas of right and wrong showed that the answers of the girls differ from the boys in two marked ways: they more often name specific acts and nearly twice as often conventional ones, the former difference being most common in naming right, the latter in naming wrong things. Boys say it is wrong to steal, fight, kick, break windows, get drunk, etc., while girls are more apt to say it is wrong not to comb the hair, to get butter on the dress, to climb trees. — *Ped. Sem.*, 1891, p. 165.

through obloquy and contempt, or without reaching success, like a Roger Bacon or a Galileo. Women have less than men of the fighting instinct, and it may be, as Thorndike remarks, that 'the fighting instinct is the cause of a very large amount of the world's intellectual endeavour.' Not only does the woman crave more for sympathy, but she has not the same sturdy independence.[1] The hero of Ibsen's 'Enemy of the People,' who had realised that the strongest man in the world is the man who stands most alone, could scarcely have been a woman. When a man is attacked by general paralysis he usually displays an extravagant degree of egoism and self-reliance; when a woman is the victim of the same disease it is not self-reliant egoism but extreme vanity which she displays. The disease liberates the tendencies that are latent in each — the man's to independence, the woman's to dependence on the opinion of others. It must be added to this that what appears to be women's tendency to be vividly impressed by immediate facts and to neglect those that are remote, is fatal to the philosophic thought which must see all things *sub specie æternitatis*. It is probably to such causes as these that we must attribute the fact that in the first rank of those who have devoted themselves to metaphysics there is not one woman.

The general character of women's scientific and intellectual tendencies is perhaps correctly described by Podwyssotsky, the Director of the Imperial Institute of Ex-

[1] It is noteworthy that even women of genius have put forth their best efforts in intimate association with another person, usually a man, active in the same field. Madame Curie, the most distinguished woman of science in modern times, was the wife of a distinguished scientific man, who shared in her investigations. Mrs. Browning's finest poems were all written after she knew Robert Browning. The whole of George Eliot's imaginative work was done while living with a man (J. H. Lewes) who shared alike her scientific and her literary tastes. Sometimes the whole of even a superior woman's intellectual activity seems to be determined by the nature of her husband's activity. Thus Lady Dilke, as the wife of a scholar (Mark Pattison), wrote scholarly books on the eighteenth century, and when she became a statesman's wife wrote with equal ability on questions of labour and economics. In such cases we need not necessarily suppose that the husband directly suggests or assists his wife's work, but he supplies the suitable atmosphere.

perimental Medicine in St. Petersburg, as more precise, more attentive to detail, in their experiments than men, but perhaps a little lacking in breadth and initiative though admirable within a limited range. This conclusion well accords on the whole with Heymans's inquiries among Dutch professors, as also with those, much earlier, of Paul Lafitte, in his 'Paradoxe de l'Égalité,' who remarks that in women the receptive qualities are most developed, and that a woman seems more touched by the fact than by the law, by the particular idea than by the general idea. 'La Bruyère, on more than one side, is a feminine genius; Descartes is the type of the masculine genius; the woman's mind is more concrete, the man's more abstract.'

It may be added that a certain number of women have attained eminence in mathematics, although none are associated with any great achievement. Thus Maria Lewen published a book of astronomical tables in the seventeenth century; the Marquise du Châtelet translated Newton's 'Principia'; Sophie Germain was a highly gifted mathematician; Madame Lepaute contributed to her husband's work, and assisted Lalande; Maria Agnesi wrote a book on the Differential and Integral Calculus which has been highly praised by mathematicians; Laura Bassi was appointed to a professorial chair at Bologna; Miss Herschel was distinguished as an assistant to her brother; Mrs. Somerville obtained a wide reputation by her mathematical and general scientific abilities; and Sophie Kowalevsky possessed great mathematical powers, which obtained for her a professorial chair in Sweden. Laura Bassi may be regarded as a typical figure among these distinguished women. As a girl she passed the severest public tests of her learning and acumen, and was admitted to the degree of doctor in philosophy. When only twenty years of age she was appointed to the chair of philosophy. Her contemporaries were equally impressed by her profound intellect and her quiet modesty; the lucidity and grace of her teaching attracted students from

many countries, and her fame equalled that of the most distinguished professors of her time. She experimented in physics, wrote verse, and was proficient in Greek; at the same time she was the devoted mother of twelve children. The evening before her death in old age she spent in the Academy, and was buried in her doctor's robes with civic honours.

Even within the philosophical field it appears that women have certain rather restricted tastes. Ladies' philosophers, according to the experience of a London West End bookseller, some years ago, are Schopenhauer, Plato, Marcus Aurelius, Epictetus, and Renan. No doubt Bergson should be added. That is to say that women are attracted to the most concrete of all abstract thinkers, to the most religious, for every one of these thinkers was saturated through and through with religious emotion.

RELIGION

This leads us to inquire what part women have had in the creation of religions. No one will question women's aptitude for religion, whatever the organic basis of that aptitude may be. It is not difficult to find evidence of this among primitive peoples anywhere. It may suffice to bring forward a single typical example, that of the East African Ukamba tribe of the Bantu race. 'It is remarkable,' says the Hon. C. Dundas, 'that in all that is mysterious and awful the rites of the women seem to excel. Indeed, in Ukamba the only mysteries that had led to disturbance have emanated from the women. They are superstitious and subject to the persecution of spirits to a far higher degree than are the men. The latter, however, in no way treat this fact lightly; it is not to them a matter of feminine weakness but of actual reality, possibly even of female superiority. This side of the woman's life, therefore, vitally affects the men.' Dundas adds that it is liable to have a retarding influence on culture, and mentions that an attempt to introduce the use of iron hoes, which the

men favoured, was defeated by the superstitions of the women.[1]

An analogous state of things is found in Christian countries, and to a more marked extent, it is probable, in Catholic than in Protestant lands.[2] Women have played a very large part in Christianity from the first, though in early times it was an undistinguished part. Agnes Dunbar's *Dictionary of Saintly Women* contains biographies of nearly 3000 holy women of Christianity, most of them commemorated in the *Acta Sanctorum*. As a rule women take but a small part in revolutions (although a large part in revolts which are of more hasty and temporary character), but an analysis of the mortuary epigraphs from the Catacombs of Rome, contained in De Rossi's work, *La Roma Sotterranea*, showed that 40 per cent of them were of women. They doubtless played an equally large part in religion in Italy before Christianity arose. Among the *donaria*, or votive offerings of grateful Romans to the gods of healing, are found heads of every size and age; 'some few,' says Dr. Sambon, 'are of bearded men, a large number of youths and children, but the great majority is of women of every age.' [3]

Women have been pious devotees. But to what extent have they founded religions? In order to answer this question I have searched 'A Dictionary of All Religions,' published in the early part of the last century. It constitutes a fascinating but painful page in the history of humanity. Some record is here given of about 600 religious sects, and I find that of these only seven were founded by women. That is to say, that of all the great religious movements of the world nearly 99 in every 100 have

[1] *Jour. Anth. Inst.*, XLV (1915), 303.

[2] But in Islam also women played a distinguished part. Among the early Sufi saints no distinction of sex was recognised. The most famous of the women saints of Islam was Rabi'a who lived at Basra in the eighth century, rising from a state of extreme poverty to a position of high veneration, which she appears well to have deserved. (Margaret Smith, *Rabi'a the Mystic and her Fellow Saints in Islam*, 1929.)

[3] *Brit. Med. Jour.*, 20 July, 1895.

received their primary impulse from men, however willing women may have been to follow. The seven sects in question are the Bourignonists, the Buchanists, the Philadelphians, the Southcottians, the Victims, the Universal Friends, and the Wilhelminians. (Some others could be added from more recent times, and we should have to introduce Madame Blavatsky and Mrs. Eddy, but it is not probable that the percentage would be greatly changed.) It is of some interest to determine the character of these sects, which are all of a more or less Christian tendency, and mostly arose within the last few centuries. Madame Bourignon was a native of Flanders, and so deformed that at birth there was some question of stifling her as a monster. She combined great intellectual power with a broad and tolerant mysticism — a combination by no means uncommon — inculcating reliance on inward impulses, the rejection of outward forms of worship, and acquiescence in the divine will. She was equally opposed to Catholicism and Protestantism, and her personality was greater than any movement she initiated. Mrs. Buchan, of Glasgow, belonged to a different type. She believed she was the woman spoken of in the Apocalypse (Rev. XII), and that she could conduct her followers to heaven without dying, but she soon died and her sect with her. She was probably insane. The Philadelphians were a sect of mystics and universalists founded by Jane Leadley in the latter part of the seventeenth century. Her views in many respects resembled Madame Bourignon's, and the Philadelphian Society was a body of considerable importance, including many men of learning. Joanna Southcott and her delusions produced so great an impression that her name is still well remembered. She was scarcely sane. The Society of Victims was a curious body of ascetics founded by Madame Brehan in the eighteenth century; it was of somewhat crazy character, and appears to have had no elements of vitality. The Universal Friends were established by Jemima Wilkinson in America in the last

century. She had a trance in early life, became inspired and able to work miracles, seceded from the Quakers, and founded a town called Jerusalem. She was an eloquent preacher, and is said to have been an ambitious and selfish woman who died very wealthy from the donations of her followers. The Wilhelminians were the disciples of Wilhelmina, a Bohemian woman of the thirteenth century. She believed that the Holy Ghost was incarnated in her anew, and thought that while the blood of Jesus only saved devout Christians, through her there was salvation for Jews, Saracens, and unworthy Christians. On the whole, it can scarcely be said that this group of sects shows badly; they were mostly tolerant, with a strong tendency to mysticism and disregard of ritual and method, and with a very pronounced element of human charity. Still the curious fact emerges that while women usually form the larger body of followers in a religious movement, as well as the most reckless and devoted, they have initiated but few religious sects, and these have mostly had little stability. Women have usually been content to accept whatever religion came to hand, and in their fervour they have lost the capacity for cold, clearsighted organisation and attention to details. They can supply much of the living spiritual substance, if a man will supply the mould for it to flow into. The study of the Salvation Army is instructive from this point of view.

POLITICS

It is somewhat remarkable that women have shown less intellectual ability in the creation of religions than in the far different sphere of politics. Nearly a century ago Burdach remarked that women are probably more fitted for politics than men, and he instanced the large number of able queens. J. S. Mill many years afterwards also made some remarks to the same effect in his 'Subjection of Women.' Among all races and in all parts of the world women have ruled brilliantly and with perfect control

over even the most fierce and turbulent hordes. Among many primitive races also all the diplomatic relations with foreign tribes are in the hands of women, and they have sometimes decided on peace or war. Whenever their education has been sufficiently sound and broad to enable them to free themselves from fads and sentimentalities, women probably possess in at least as high a degree as men the power of dealing with the practical questions of politics.

It may not be out of place to add that there is no reason whatever to suppose that women, taken altogether, tend to sympathise more with one political party than with another, or that their participation in politics affects the balance of political parties as established on a purely masculine basis. Women are quite as conservative as men and quite as radical as men. This came out clearly in Heymans's inquiries in Holland. Nearly three times as many men as women were interested in politics, but of those interested 13.7 per cent women were Socialists or Anarchists as against 8.9 per cent men; 30.7 per cent women were Radical as against 21.7 per cent men; 27.5 women were Conservatives and 17.1 per cent men. But only 41.8 per cent women were moderates as against 61.2 per cent men. Thus both extremes are more pronounced in women, but men greatly predominate in the intermediate region. This result is probably of general application and Heymans considers that it is connected with the greater impulsiveness of women, and with their greater emotional intensity within a somewhat narrowed sphere. It is probable, however, that women, taken collectively, present somewhat different patterns in different countries. In Holland, where women have long enjoyed much independence, the pattern may be regarded, it is probable, as very near the general normal rule. But in Germany, where women still feel the influence of ages of training in docile submission, that training still influences their political votes. Thus in the elections of 1928 the old German Nationalist Party obtained nearly half as many votes

again from the women, while the Communist vote of the men exceeded that of the women in almost the same proportions; the Socialists and parties of the Centre were more supported by women than by men; the Catholic Centre Party, as is normal with clerical parties, being very strongly supported by women. The voting age for women is in Germany twenty.

In the British Empire the women of New Zealand were the first to receive the political franchise on the same terms as men, but New Zealand has sent no woman to Parliament (Australia only a few), and (as also in Australia) New Zealand women play no active part in politics. The reason is said to be that there are too few women of leisure and money, and also that they are not encouraged by men to engage in political work. The political objects in which women in New Zealand are said chiefly to show an interest are those of a social and practical and humanitarian kind, especially concerning their own sex, such as Pension legislation, Children's Courts, social hygiene, the condition of women in prisons and reformatories, amendments of the criminal code.

SUMMARY

It cannot be said that in this chapter we have reached many definite results. It will be seen that on the whole, however, the qualities of intelligence in men and women, though not of identical character or value, may be said fairly to balance each other. This can, indeed, be clearly demonstrated so far as the whole period of the educational life is concerned. At this time of life, in fact, the balance of superiority is on the feminine side. Girls are aided by a better memory and a variety of emotional and moral qualities which involve a greater docility. Boys, however, possess other qualities which contain the promise of ultimately greater intellectual development. This is well shown by the results of the differentiated inquiries of Heymans among professors and teachers in Holland.

Although the general capacity to learn was regarded, on the whole, as fairly common to both sexes, and although in at least six different respects the majority of opinions favoured the superiority of women, there were yet important respects in which the men on the whole were regarded as superior.[1] Men are better able to apply what they have learnt; men are very much more inclined to supplement what they have learnt by reflection or further independent investigation; men have a more *precise* knowledge in their own department; men are, without doubt, more apt to supplement the prescribed course of reading by independent scientific reading; men adopt more reasonable methods of study (although women give more impartial attention to all the various branches of their work); men feel much more at home in the scientific field; and finally (though here a considerable minority of teachers find no sexual difference) men have greater power of observation. These are qualities which in later life often enable men to advance beyond women in vocations requiring high intelligence for success.

Holland is, in these respects, fairly representative of other countries. In America F. S. Lee finds that in the physiological laboratory women have less resourcefulness and initiative, though when once the research is planned they can correctly carry it out with accuracy and persistence. If, however, the apparatus they are using goes wrong they are usually less successful than men in putting it right.[2]

Exactly the same results were reported from England by the Consultative Committee of the Board of Education in 1923. 'Experience with research students corroborates the common view that constructive force and initiative come chiefly from the men, while the women students almost without exceptions worked conscientiously and industriously along lines laid down for them.' Girls do better at languages and literature, for they read more, but

[1] Heymans, *Die Psychologie der Frauen* (1910), 126.
[2] F. S. Lee, *The Human Machine*, 55.

they tend to reproduce rather than to reason; girls know geography and history better; but boys show more originality and freshness in their ideas. In mathematics girls show more aptitude for book work than for problems, and in science they are 'microscopic rather than telescopic in their outlook'; boys excel in experimental work, in initiative, in the capacity of judging phenomena, and in reasoning.

In general, Thorndike concludes for America, experimental statistical studies lead to the result that the average man has more mechanical ability, better motor control, and does better in tests of judgment; in schools and colleges he makes a relatively better showing in economics and history and the sciences, and perhaps in mathematics. Women average better in receptivity or impressibility; they are quicker in association, have better memories, and excel in such subjects as literature and music. But the most important characteristic of these differences is their small amount.[1] Terman, somewhat similarly, concludes that the *average* intelligence of women and girls is as high as that of men and boys.[2]

I have sometimes seen it stated that the great aptitude of women for patient industry is a contradiction of their greater aptitude for emotional change. It may be an apparent contradiction. But all life is made up of such 'contradictions.' It is precisely because it has succeeded in uniting contradictions that life has come into being. Every systole of the heart is a contradiction of its diastole, but it is because the heart has succeeded in uniting this contradiction that it is alive.

Women dislike the essentially intellectual process of analysis; they have the instinctive feeling that analysis may possibly destroy the emotional complexes by which they are largely moved and which appeal to them.[3] Women dislike rigid rules, and principles, and abstract proposi-

[1] Thorndike, *Educational Psychology* (1914), III, chap. IX.

[2] L. M. Terman, *The Measurement of Intelligence* (1919), 68.

[3] This may be seen in relation to religion. Thus Ruediger (*Am. Jour.*

tions. They feel that they can do the right thing by impulse, without needing to know the rule, and they are restive under the rigid order which a man is inclined to obey upon principle; a woman is inclined to introduce a little variation, Heymans remarks, even in the cooking recipe which is given to her. Similarly women automatically tend to convert an abstract proposition into a practical concrete case.

These are not defects of the feminine mind, but they are sexual differences, and they involve on the whole — however numerous and brilliant the exceptions — a certain distaste and inaptitude for science. Even as students women show a relative lack of intellectual curiosity, and are less keen and less skilful in solving problems.[1] They feel a relative lack of interest in scientific problems. Even in the domestic sphere, it is men, not women, who invent labour-saving devices for the home. In 1922, at the London Offices of the Design and Industries Association, there were from fifty to sixty new labour-saving devices for the home, but not one was invented by a woman. 'Theoretically,' said Mr. C. A. Farmer, the Secretary of the Association, 'the women ought to be the inventors, but in practice the inventions and suggestions we get are from men. I know of only one household invention by a woman. It is the man who is making the home work lighter.' Helen Thompson considers that this lack of interest in problems may explain the failure of women to do well in some of her tests. Heymans, also, attaches great weight to the lack of interest in impersonal problems as explaining the inaptitude of women for scientific work.[2] He brings forward, for

Psych., July, 1907) among American teachers and students, found that although 69 per cent of the men had received much religious instruction in youth, as against 61 per cent of the women, yet 26 per cent of the men rejected their early beliefs as against only 17 per cent of the women, and 44 per cent of the men readjusted their beliefs as against only 36 per cent of the women.

[1] Helen Thompson noted this among students at Chicago, *Mental Traits of Sex*, 109.

[2] Heymans, *op. cit.*, 87, 144, 146, 152.

instance, the point that while there seems no doubt that in the ordinary affairs of life men are less infused with emotional interests, and women keener observers than are men, in their studies, when observation is not prompted by emotional motives but must be voluntarily directed on to a new subject, women tend to be less keen observers than are men. 'Woman,' again, Gina Ferrero Lombroso says in her 'L'Anima della Donna,' 'views the universe with the eye and the heart of a mother.'

These characteristics, by which on the average women seem to be marked, are probably correlated with instinctive and emotional qualities which may fairly be regarded as organic. They do not, it need scarcely be said, interfere with the fact that some women are brilliant in science or keen and subtle in analysis. They merely render it less easy for the average woman than for the average man to become devoted with success to the deliberate and disinterested pursuit of knowledge or to apply to practical affairs initiative and reason. In the ordinary course of life the intelligence of women, whatever sexual differences may exist, proceeds side by side with that of men.

That conclusion, it need scarcely be added, accords with all that we know of the universal activities of men side by side with women in our civilisation. In the last quarter of the eighteenth century, Restif de la Bretonne wrote in many volumes a large collection of short stories — or 'adventures of the prettiest women of the present age' — to illustrate the manners and customs of his time. It has been calculated by Assézat that these French women described by Restif exercised nearly three hundred different occupations, some of them now extinct.

To-day there are few occupations which are not exercised by at least some women. In the United States of America, a few years ago, out of a total list of 678 occupations, there were only 33 which showed no women recruits. The Great War brought women into many new occupations, and in some of these they subsequently re-

mained, though in much diminished numbers. In the United States there are now some nine millions of women working, and in an American Women's Year-Book it is stated that such occupations as street-cleaning, truck-driving, and plumbing have become 'as much feminine occupations as playing the piano and sewing fine seams were generations ago.' Stevedores, dock-labourers, blacksmiths, carpenters, brick-makers are now sometimes women in America, while there are a vast number of physicians, dentists, clergywomen, and artists, and some engineers.

In Australia — where the chief characteristic of the women, according to one of them, is 'assertive independence' — somewhat similar conditions are slowly tending to prevail; a very large proportion of the women workers are still engaged in domestic work, but the proportion is tending to decrease even absolutely and the demand for women in commerce and industry is increasing. Women play a considerable part in the educational life — primary, technical, and secondary — and in medicine, though only to a small extent in law, and do not seem to be specially drawn to the arts. There are women magistrates and policewomen.

In Great Britain, according to the Census of Production (as reported in the 'Board of Trade Journal' for September, 1928) the proportions of females to males in the industries to which the census applied was roughly one to three. It was almost exactly the same proportion as existed nearly twenty years previously (24.5 per cent against the earlier 24.3 per cent), indicating that there had been no significant displacement of male and female labour, although the number of both male and female workers has increased. A considerable decrease of women in textile and clothing industries is noted. But there is a notable increase of women in clerical and administrative occupations, and in the manufacturing trades it is in the operative staff side that the female increase is most notable. New trades and

newly developed trades (like manufacture of cigarettes, electric lamp bulbs, thermionic valves, etc.) have given a special scope for female employment, which cannot therefore be regarded as a displacement of male labour. But there is in Great Britain an important change in employment under the age of eighteen in manufacturing industries, for here there is a large decrease in the number of males and a slight increase in the number of females.

When we go outside the English-speaking lands we find the same tendencies developing, though to varying extent, and with differences of form conditioned by special national tendencies.

CONCLUSION

The study of intelligence, we have seen, is not an altogether satisfactory study. We started with the statement that the dryest light of the intellect is coloured in infinite ways. There are, as we have again and again been reminded, fallacies to be encountered on every side. If, for instance, we are dealing with unanalysed general tendencies we must be cautious in drawing conclusions as to the relative precocity of the sexes; the question needs to be broken up and answered (as, for instance, Florence Goodenough remarks) in terms of specific functions or traits. Even if we accept, as on the whole we are bound to accept, the greater precocity of girls, we still have to explore the significance of that conclusion. Lipmann, in his elaborate and comprehensive survey of the recorded results, accepts the consensus of opinion of a general superiority of girls in school work, but he does not consider that this proves a higher level in intelligence; it may more probably mean a greater average industry, supplementing a defective intelligence, since boys predominate among the most intelligent pupils and also among the laziest. When we think we are investigating 'intelligence' we are really investigating quite other qualities. We may also be investigating the concealment of superior intelligence by a greater modesty or

shyness. We may, again, as Lipmann further remarks, be investigating not so much the aptitudes and characteristics of the pupils as those of the teachers; he points out that boys who up to the age of ten are taught with girls often, when transferred to men teachers, at once begin to show better. It has also been said by various feminine critics that, even when the two sexes are investigated together, the sex of the investigator may affect the results; the pupil will react to the sex of the investigator, and the investigator will react to the sex of the pupil.

'The pack of modern investigators can be called off,' Spearman has exclaimed, 'they are following a false scent.' [1] Even if we feel more respect for their investigations we have to admit that the time has come when such investigations need to be placed on a wider and more genuinely biological foundation. Karl Pearson found reason to believe that with a higher degree of intelligence are correlated a slow pulse, a slow respiration, and a low temperature. Those correlations, if they really exist, must be of the first importance. Yet they are completely ignored in the trivial and laborious reports so often submitted to us. Such reports serve merely to obscure that fundamental organic distinction between the male and the female which must inevitably be mirrored in the psychic life.

Finally — if we take a wider sweep than in this chapter we have yet attempted — it is necessary to observe that in comparing the sexes in their intellectual and industrial aptitudes we have here nearly always been comparing them on masculine ground. That is to say that we have been trying to ascertain how women show when they enter fields of activity which have already been staked out by men with a constant eye on their own masculine aptitudes. It was worth while to show that when women enter these fields — as under the present special phase of what we call

[1] Spearman is not, indeed, quite sure whether 'intelligence' should not be consigned to the rubbish heap, though on the whole he thinks we may keep it, making it cover the three 'neogenetic' principles: apprehension of experience, eductibility of relations, eductibility of correlates.

civilisation they were bound to do — they could in every capacity play a highly creditable part. That they could not, on the average, equal man in man's own fields is a conclusion which should now seem so obvious that many will wonder why they had not discovered it beforehand. It might have been more readily discovered if we had definite statistics concerning the success of men when they enter the fields of activities which have already been staked out by women with a constant eye on their own feminine aptitudes. Certainly there are men who in the organisation of the home, in the adornment and care of the house, in the art of cookery, in the tending of children, and in all the occupations which radiate from this central vocation, are fully the equals of women. But these, at all events under the conditions of our present phase of culture in Europe and America, are rare and specially constituted men. In this field, which is woman's more peculiarly than the factory, the post-office, the laboratory or the classroom, boys show little aptitude and no desire to shine. The home, which of all human institutions is the most centrally important, is made by woman. Her psychic constitution fits her for this task. Whatever the defects of the homes made by women — and these defects are many, largely because women have thrown so much energy into masculine avocations — the homes that are exclusively made and run by men are so few as to be practically non-existent, and even the best of them so poor that it is seldom that they can be compared with those made by women. The normal man, from his earliest years, is rebellious to a concentrated activity on feminine vocations. We ought not, therefore, to be surprised that exactly the same may be said of normal women, even those of the most distinguished intellectual capacity, with regard to masculine vocations. Thus Maria Agnesi, the beautiful Milanese woman who in the eighteenth century displayed from her earliest years the most versatile intellectual aptitudes and at the age of thirty published the 'Instituzioni Analitiche,' which placed her

in the first rank of the mathematicians of her time and led to her appointment as professor of mathematics at the university of Bologna, four years later abandoned through ill health that post and all scientific work, to give herself to the care of her young brothers and the organisation of the nursing of the sick poor; and to such feminine occupations she devoted happily the whole of the remaining forty-seven years of her life. In the nineteenth century, again, Sophia Kowalevsky, who also attained the highest distinction as a mathematician, was haunted by dreams of love and repeatedly remarks in her letters that nothing bores her so much as mathematics; at one time she had a mania for working at embroidery from which she with difficulty dragged herself away to mathematical work. And these women were certainly typical, save in their intellectual brilliance, of their less distinguished sisters.

It was necessary that we should ascertain, as carefully as may be, the degree of success which women achieve in the fields men had made their own. It is now necessary also that we should realise the limited significance of any conclusions we thus reached.

CHAPTER XV

THE VARIATIONAL TENDENCY

What is a variation? — An anomaly — In what sense pathological — Most abnormalities more common in men — The influence of the pelvis on the side of mediocrity — Still-born children — Sexual proportion of congenital malformations — Muscular abnormalities — The ear and its abnormalities — Psychic abnormalities, idiocy, genius, etc. — The primitive racial elements in a population perhaps more clearly represented by women — Women more disposed than men to preserve ancient custom and ancient methods of thought — The organic conservatism of women — Advantages of this sexual difference.

WHAT is meant in terms of biology by a 'variation'? That is a question which when 'variations' first began to be spoken of was seldom asked, and even half a century ago no need seems to have been felt to ask it. All the great early biologists who spoke of 'variations' were quite clear in their minds as to what they meant.

But 'variations' is not only a biological term, it is also a mathematical term, and at the centre, though they can easily be made to blend at the periphery, the two conceptions of 'variation' are completely distinct. The biologist is concerned with definite innate individual peculiarities, the mathematician with the statistical characteristics of groups, and whether or not the biologist's variations come into his field, and whether or not they are innate, is a matter of complete indifference to him; he remains content even though the variations he finds may simply be produced by the influence of the environment. The confusion thus arising is largely due to Professor Karl Pearson, who (taking up a suggestion thrown out by Galton) approached biology from the outside as a trained and accomplished mathematician. In 1896, in a long essay published in his book 'The Chances of Death,' without discussing the meaning of the word 'variation' or realising that he was intruding a foreign conception into this field, he denied the conclusion generally reached by biologists that variations

more commonly occur in the male sex and asserted the opinion, based to a considerable extent on minute differences in the size of the long bones, that variation is more common in the female.[1] Since then a number of investigators, who equally failed to explain what they meant by 'variation,' have followed in the same path, and, as was no doubt inevitable, have reached completely contradictory and confusing results. It was a blind alley that the combatants were entering, and we cannot be surprised that they annihilated one another and were never seen again.

It is not to be assumed that this process, however fatal, is a matter for regret. There really is a sphere for the mathematical statistician to play with the 'variations' of those groups of figures he loves to manipulate. We do not thus learn anything of biological origins but rightly interpreted the results here obtained may tell us something about the influence of the environment, when we are dealing with material data, or of society when we are dealing with psychic data. From the central biological standpoint, however, the study of statistical distributions so brilliantly inaugurated by Karl Pearson — whether they deal with the millimetrical 'variations' in the long bones or the ever-shifting 'variations' in the class position of boys and girls — are but of peripheral interest.

The word 'peripheral' is here deliberately used. All natural groups, we must never forget, show pronounced nuclei at the centre and at the periphery are vague, there merging with other natural groups. It is not denied that the biologist's definite individual variations pass at the periphery into the mathematician's statistical group 'variations.' If we understand that we may escape many confusions.

Thus Terman in one place denied any greater 'varia-

[1] I discussed the fallacies of this method and this use of the word 'variation' in biology in an appendix to the English edition of the present work. It is not here reprinted as I trust that the point has now become fairly clear to most of those who are interested in the question.

tion' among boys and in another place stated that there is a notably greater proportion of 'gifted' boys (55 per cent as against 45 per cent girls). Spearman has pointed to this apparent contradiction, and states that the two results are 'difficult to reconcile.' [1] But they would have been perfectly easy to reconcile if those who have sought to follow the squirrel-track of Karl Pearson (however interesting to follow when properly understood) had first asked themselves what it was they were trying to find out. They would, indeed, have been saved from perpetrating many stupidities if they had first consulted a good dictionary. They might then have realised that to investigate the statistical proportions of groups with their minute variabilities was a different task from the discovery of definite biological and individual anomalies. To muddle up the two necessarily led to contradictory results, the more contradictory the more honest the investigator. Minute *variabilities* do not amount to an individual *variation*, just as individual *variations* do not amount to a specific *variety*.

We thus see that variation within the normal range is not the same thing as variation outside the range. The minute variability of a large group must not be confused with the large individual variations which remove an individual from the group, and the two kinds of varieties cannot be explained in the same way. This is clearly to be discerned in the work of the most careful investigators, and is well illustrated in the interesting field of psychic aptitudes. We may for instance turn to the work of the Presseys, who have the advantage of being a man and a woman working together, and so escape the criticism of sexual prejudice sometimes directed at the investigator, male or female, of one sex. These investigators found that in median measurements, whether for general ability or special ability, girls tend to rank rather higher than boys, and since they attribute this to the greater precocity of girls we may fairly say that in the median range there are

[1] Spearman, *Abilities of Man* (1927), 389.

no pronounced sex differences in degree of ability.[1] But when the investigation was pushed to the two extremes quite a different result was reached. The nearer to either extreme the two Presseys reached the more the boys predominated, and the investigators were themselves surprised at a result which seemed so opposed to the median superiority of girls (though of course, in reality, nothing could show more clearly that we are here dealing with two groups of phenomena). They conclude that their results 'hardly permit of any other interpretation than that, age for age, boys show more extremely bright and extremely dull individuals than girls.'[2] With this result may perhaps be said to harmonise the conclusion of the study on variability by Thorndike and associates that, among over 5000 boys and over 6000 girls, the high scores came from boys (36 boys to 12 girls), though the highest of all was a girl.[3] It is worth while, moreover, to call attention to this finding, for while it supports the conclusion, to which we shall see the facts generally tending, that the (favourably or unfavourably) exceptional individuals are predominantly males, that conclusion implies the presence of a proportion of females, small in number, but at least as exceptional.

It is, however, on the physical side that this problem, and its difficulty, have most definitely been realised. We may conceive of a race of animals or of plants as a group of individuals nearly all capable of being arranged in an orderly series with respect to the condition of a particular character. Within the series every individual is different,

[1] Thorndike similarly found greater variability of girls towards age of puberty which he attributes to sex difference in rate of growth, and Mrs. Hollingworth suggests that the greater industry of girls (to which their frequent high school standing is sometimes attributed) may be due to their precocity. A. L. Winsor (*Jour. Ed. Psych.*, May, 1927), in harmony with many other investigators, concludes that, within the normal range, variability shifts from age to age, as well as from problem to problem, when sex comparisons are made, and the difference is 'practically negligible.'

[2] L. Pressey, *Jour. of Applied Psych.*, II (1918).

[3] *Ped. Sem.*, 1926, p. 183.

but the differences are minute. There are, however, a few individuals who in some particular character or characters are separated from the main group by differences which are not minute but extreme, so that they fail to fall into the orderly series; these are the biologist's true 'variations,' or by whatever other name, less liable to be misunderstood, we choose to term them. They are apart from the others, yet we have to accept the fact that it is not possible to find a clear line of demarcation separating them from the others. This was clearly explained in the anatomical and physiological field many years ago by Professor Ernst Schwalbe of Rostock. We have, as he stated, a range of minute differences for every single organic part of the individual, independently of what the cause of the difference may be, and these differences may be called 'variations' if we will, provided that we clearly understand our own definitions. But we have also, in Schwalbe's words, the 'change of form (or of position, size or number) of one or more organs or organic systems of the whole body occurring during fœtal development, and so congenital, which goes beyond the range of the species,' as exhibited in the orderly series of differences. It is possible to term these changes outside the series 'malformations'; biologically they are 'variations.' Essentially the distinction is that the minor changes within the series may be due to fluctuating rates of growth or to environmental influences; the pronounced changes outside the series are due to a congenital developmental impulse and cannot fluctuate. The two groups of manifestations are clearly distinct at the centre, but, as Schwalbe rightly concludes, we cannot always draw a clear line at the points where they meet.[1]

It may now perhaps begin to be clear what is meant biologically by a variation. Its connection, however real, with the uncertain and minute variabilities of large masses of data within normal limits, is remote, and to take such trifling and ever-shifting variabilities into consideration is

[1] Ernst Schwalbe, *Missbildung und Variationslehre* (1910).

merely to throw a veil of confusion over the great essential facts; and this, as we know, is just what has frequently happened during the past thirty years. The true biological variation is an individual *anomaly*.

An anomaly, while it is a phenomenon that falls out of the normal range, is not to be identified, as has sometimes been done, with a diseased condition. This was long ago clearly recognised by a great authority of the past. 'I am of the opinion,' said Virchow in 1894 at the Innsbruck meeting of the German Anthropological Society, 'that a transformation, a metaplasia, in an individual animal or plant, or in their individual organs or tissues, is impossible except as an anomaly. For the previously existing physiological norm must be changed, and that cannot well be termed anything but an *anomaly*. An anomaly, however, was in old days called *πάφος*, and in this sense every deviation from the norm is a pathological event. . . . I must observe that pathological does not mean harmful; no disease is indicated; disease in Greek was *νόσος* and what concerned the diseased person was nosology. The pathological can, under some circumstances, be advantageous. The object of pathology is called an anomaly, and when the pathological becomes hereditary special family peculiarities arise, and the first deviation, which appeared as an individual variation, becomes a hereditary variation.'[1] Similarly, a great botanist of that period, Sachs, regarded a variation as a 'peculiarity of hereditary origin.' To-day the variation is (following De Vries) commonly called a mutation, and Morgan terms colour-blindness a sex-linked mutation, while Punnett has suggested that its rarity in women may possibly entitle us to call genius, like colour-blindness, a sex-linked mutation.

[1] Virchow made similar statements on other occasions (as, e.g., *Zt. f. Eth.* (1893, Heft 5, p. 211) and pointed out that though it may constitute a certain predisposition to disease, the pathological is not itself morbid. 'Pathological' is currently used as synonymous with 'diseased,' and that may be convenient. But it has the disadvantage that we are left without any sound word to designate the science of anomalies. No harm, however, is done by our terms if we clearly bear in mind the definitions of those terms.

It was at one time supposed that women are more variable than men and more liable to exhibit unusual congenital formations. John Hunter, it is true, who first touched on the matter from a biological standpoint, vaguely indicated that males are more variable than females; but Meckel, on the contrary, came to the conclusion that in the human species females show a greater degree of variability, and he thought that since man is the superior animal and variation a sign of inferiority the conclusion was justified. 'We may state as a principle,' Meckel wrote more than a century ago at the outset of his manual of descriptive and pathological anatomy, 'that anomalies are more common in the female. This phenomenon seems to depend on the eighth law [Meckel's "law of development," according to which woman is more primitive than man] since the organisation of the female results from development being arrested at an inferior degree.' But while he regarded deviations as on the whole more common in woman he admitted certain exceptions, and more especially instanced the heart and the bladder as more variable in man.

Meckel was a profound student of anatomy, but not a very luminous thinker. It by no means follows, even if we accepted his law as to the greater primitiveness of the female, that anomalies should therefore be more frequent in women; the opposite inference would, indeed, be equally plausible. Some years later Burdach took up the question in his 'Physiologie.' That great biologist at once raised the problem to a higher level, realised its wider bearings, and cleared away the prejudices which had surrounded it. He recognised that in some respects women are more variable than men, but pointed out that, contrary to Meckel's opinion, this was no indication of woman's organic inferiority. He showed from the statistics of the Anatomical Institute of Königsberg that we must distinguish between different kinds of abnormality. Further, he referred to the facts that indicate that woman is more childlike than man,

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but, he added, 'it is a very common but a very gross error to consider age as a scale of perfection and to regard the child as absolutely imperfect as compared to the adult. It is not imperfection but simply certain childlike characteristics that women preserve'; and, he pointed out, it is in decrepitude that women take on the characteristics of the so-called superior sex. His general conclusion was that the nature of man and the nature of woman are both excellent, but there are wider variations in men, more genius and more idiocy, more virtue and more vice.

Darwin turned his attention towards this point, and accumulated data. In 'The Descent of Man' he brought together many of the chief facts then known concerning variation in man and woman. All the evidence that he could find pointed in the same direction, and he concluded (Part II, chap. 8) that there is a 'greater general variability in the male sex.' [1] It cannot, however, be asserted that all the implications of this conclusion are yet clearly recognised.

It may now be clear why, when we are considering biological 'variations' or 'mutations,' it is unprofitable to concern ourselves with measurements of size. Anomalies in size do not reach us alive in their due sexual proportion, for they have to contend at an early period of life with a powerful force on the side of equality and mediocrity. This, as we have already seen, is the narrowness of the maternal pelvic outlet, which allows boys to pass through less safely than girls. Still-born children are more frequently boys than girls, the proportion sometimes being about 140 males to 100 females.[2] If it were not for this

[1] It is perhaps another aspect of the same fact that, as C. Sedgwick Minot pointed out in his book, *The Problem of Age, Growth and Death* (chap. III), boys grow more forcibly than girls, that is to say, their yearly percentage of increase in childhood is greater than in the case of girls. The same phenomenon is observed in the animals whose rate of growth has been accurately studied, as the rabbit and the guinea-pig.

[2] So also as regards abortions and premature births. The vast majority of aborted fœtuses are male (*Zt. f. Sexualwiss*, Aug., 1914) and the proportion of male premature births to female is said to be 160 to 100 (*Arch. f. Frauenkunde*, 1914, p. 26.)

levelling influence the proportion of men exceptional in physical or mental development would be even larger than it actually is. Thus Boyd's tables have shown that the average brain-mass in the children who are born dead at full time is larger than in those who live; and that while the average new-born living male child at full time has a total brain-mass only about 1½ ounces heavier than the female (and the maximum brain-weight in a living child was actually found by Boyd in a female), among the still-born the maximum male brain is nearly seven ounces larger than the maximum female brain, although the minimum still-born male brain is only a little over an ounce larger than the minimum female brain. Statistics of English and Scotch infants collected by the Anthropometric Committee of the British Association showed that while the range of height in the male infants was 10 inches, in the female infants it was only 8 inches. Exceptional weight in new-born children is most usually found among the males. This preponderance of exceptionally large male infants is indeed everywhere found; and as we reach the extreme degrees of infantile giantism the male preponderance increases. At the same time we must recognise that occasionally even the most extreme anomalies may be found in the female sex. It is not a question of the possibility of anomalies in females but of their relative frequency. Thus the case has been carefully recorded in England, under hospital conditions, of the birth of a still-born female child weighing (by different weighing machines and with different observers) 24 lbs. 2 oz.[1]

It is because of the selective action of the pelvis, and the influences of later life, which do not always act equally on both sexes, that we are not entitled to introduce the factor of size in discussing the incidence of variations in men and

[1] E. L. Moss, *Brit. Med. Jour.*, 7 Oct., 1922, p. 643. Both parents were six feet in height; the mother was well proportioned and healthy and recovered from the confinement in an uneventful way. In America, D. P. Belcher (in the *Jour. of Am. Med. Assoc.* for 1916) has similarly recorded the birth of a female still-born child weighing 25 pounds and perfectly formed.

women.[1] There is good reason to believe that so far as size is concerned men are not more variable than women, and probably less so.[2] This appears to be the result of unequal selective influences from birth on, and has no necessary bearing on the primary incidence of variations. At birth, Gini concludes, males are more variable in measurement than females, though they are not so afterwards.[3]

Abnormalities of most kinds having their origin in some arrest of development, or unknown origin at an early period of embryonic growth, are for the most part more common in males than in females. This is shown, for instance, both by the English Registrar-General's Reports and the surgical records of any large hospital; while among 50,000 English children Warner found the percentage with minor classes of defects was 18.04 boys and 14.71 girls. Among Scottish children of age of 5 in Glasgow Bruce found twice as many congenital deformities among boys, and among 1000 American children Macdonald found that nearly every class of abnormality is more frequent among boys. Hrdlicka, also, in an elaborate investigation of 1000 children in the New York Juvenile Asylum, found that both among the white and the black children abnormalities were more frequent in the boys.

If we consider the deaths per million from congenital defects we find (as Harry Campbell has pointed out), that the average is decidedly higher for the male sex. Surgical experience among the living gives a similar result. Thus in the extensive records of the Western Infirmary of Glasgow, Andrew found that congenital malformations were 60.5 per cent in males and only 39.4 per cent in females;

[1] Helen Montague and Leta Hollingworth, 'Comparative Variability of the Sexes at Birth,' *Am. Jour. Sociology*, Nov., 1914.

[2] K. Pearson, 'Variation in Man and Woman,' *Chances of Death*, I: also Giuffrida-Ruggeri, 'La Maggiora Variabilità della donna dimostrata col metodo Camerano,' *Monit. Zoolog. Ital.*, 1903, no. 12; Frassetto, 'La Variabilità del Cranio umano,' *Atti. Soc. Rom. Antrop.*, 1901, p. 155.

[3] Gini, *Studi Economico-giuridici*, Cagliari University, 1910 (summarised in *Statistical Jour.*, Jan., 1911, p. 232).

moreover in every separate important group, except cleft aalate,[1] males were distinctly predominant. Among acquired defects, on the contrary, due only to weakness (such as flat-foot, knock-knee, bow-knee, etc.) females were in the majority.[2]

Again, in London, at St. Thomas's Hospital, I find that hare-lip, for example, occurred in more than twice as many males as females. Bryant's note-book showed almost the same proportion, while Manley found 27 males to only 6 females. Double hare-lip is almost exclusively found in males. Hare-lip with cleft palate is always much more frequent in males. Cleft palate alone is, however, more often found in females, though this rule is not invariable. Spina bifida is also usually, though not always, slightly more common in females. Nearly every other important form of malformation is found more frequently in males than in females. Congenital absence of the fibula seems to occur almost exclusively in males. The most important form of club-foot (talipes equino-varus) usually indicates an arrest of development, as it represents the normal position of the foot in the apes and in man before birth; it is much more frequent in males; if we take large figures we find, according to Duval, that 364 males exhibit congenital club-foot as against 210 females, while the acquired forms are also more common in males.[3] Imperforate anus, meningocele, ectopia vesicæ (1 female in 10 cases, according to John Wood), abnormality of the vermiform appendix,[4] are all more common in males. Con-

[1] If nævus or birthmark be regarded as a congenital abnormality, it, also, is an exception, being twice as frequent in females as in males. Fitzwilliams found that in nearly 700 cases, 65.2 per cent were females.

[2] J. C. Andrew, *Age Incidence, Sex and Comparative Frequency in Disease* (1909).

[3] Infantile palsies, acquired in early years, and involving various deformities of the foot, were found by Muirhead to affect the sexes almost equally. But they were more often severe in the boys, and more often affected both limbs.

[4] We may perhaps connect this fact with the much greater frequency of appendicitis in men, less than 20 per cent cases being in women. There may, however, as Woods Hutchinson indicates (*Human and Comparative Pathology*, 52), be other factors at work.

genital dislocation of hip is a marked exception, the proportion being about 4 or 5 females to 1 male, and another exception (according to J. H. Morgan) is furnished by congenital fissure of the cheek; both these defects, like those which are more common in males, are probably due to arrest of development. But congenital hypertrophy of the pylorus of the stomach is much more common among boys; among several hundred cases Still found only 15 per cent girls. It is congenital, and strictly physiological rather than anatomical. 'What is congenital,' Still remarks, 'is apparently some lack of stability in the harmony of gastric and pyloric relaxation and contraction, so that the child starts life with a machine which, although able to work passably well for a few weeks, is certain soon to get out of order.' [1] It is not yet clear that we can generalise concerning the developmental defects most common in males and those most common in females, though this may be possible when our knowledge is more complete.

Supernumerary digits both on the hands and the feet are much more frequently found in males than in females. Supernumerary breasts and nipples are also commoner in men; among several hundred persons Mitchell Bruce found that 9.1 per cent men and only 4.8 per cent women possessed an extra nipple, so that it is nearly twice as frequent in males. Although goitre is much commoner in women than in men, it is remarkable that congenital goitre occurs much more frequently in males. The majority of cases of transposition of viscera (in which the heart and the stomach are found on the right side and the liver on the left) are found in males. An additional (eighth) true rib is an interesting anomaly which was especially studied

[1] G. F. Still, *Brit. Med. Jour.*, 7 April, 1923. Still sees reason to believe that, even allowing for the number of families with only one or two children, this anomaly is more apt to occur in the first-born. In this respect it resembles a considerable and perhaps very large number of anomalies, of both favourable and unfavourable character, even including genius. (See Havelock Ellis, *A Study of British Genius*.) When we have discovered the meaning of this fact, we may perhaps know more about the special incidence of variations on the male sex.

by Cunningham; he found it to occur twice in a male to once in a female; it is normal among the lower apes and in the chimpanzee, and may therefore be regarded as a reversion. Cervidalli and Benassi, in their elaborate anthropological study of the hand, found that even the papillary lines of the fingers, alike in the sane and the insane, show a greater polymorphism and asymmetry in men than in women.[1]

The majority of muscular abnormalities are found in male subjects. It would be of little interest to consider in detail the results reached by Wood, Schwalbe, Macalister, Wenzel Gruber, and others, but on the whole there seems to be little doubt of the fact, although there are exceptions as regards certain muscles. G. Schwalbe, a great authority in anatomy, while affirming the greater range of variations generally in males, alike among lower animals and man, pointed out exceptions such as the *palmaris longus* muscle which is more often missing in women than in men. Macalister, another authority, considered that anomalies of fission also formed an exception, being more common in females, while new muscular germs (that is to say, the trace of muscles usually found in other animals but not in Man) are more frequently developed in the male.

The sexual differences in abnormality are sometimes complex. We may, for example, take the anomalies of the ear, which have been carefully studied by numerous investigators in various countries. It is pretty generally agreed that, as Ranke states, the ear in women is more finely modelled and less subject to abnormality than in men, though Schaeffer is of opinion that this difference is apparent only, and is merely due to the ear in women being smaller and defects less obvious. But in the ear, as Sir Arthur Keith who has carefully studied it,[2] remarks, sex is really a powerful factor. Keith distinguishes in Man the chimpanzee-type of ear and the orang-type. This does not mean, of course, that those who possess these ears

[1] *Arch. di Psichiatria*, XXX (1909). [2] A. Keith, *Nature*, 7 Nov., 1901.

are thereby more nearly related to either of these apes. It refers to the fact that the orang possesses an external ear which has undergone marked retrograde changes to a small and delicate shape, while the chimpanzee has preserved a large and prominent ear of more primitive type. The gorilla has a wide amplitude of variations towards both these extremes, and in this respect Man resembles the gorilla. It is not, however, to be supposed that the human ear shows a tendency to diminish in importance; it is merely the outer portion (the helix) which has diminished, while some other portions have increased in development. Keith finds as a result of many thousands of observations, alike in England, Wales, Ireland, and among Jews, that the orang-type, or higher type, of ear, is everywhere more prevalent among women than among men (on an average 45 per cent women and only 18 per cent men) while the coarser chimpanzee type of ear on the contrary occurs four to five times more frequently among men than among women. 'That,' Keith remarks, 'is what one may expect, for in bodily characters, always excepting those of a sexual nature, woman apparently foreshadows the coming characters of the race.' (Without affirming that the orang-type of ear is a sign of aristocratic birth, Keith adds that he had found it in five out of eight peeresses, but in only one out of five lady-singers.) Schwalbe, somewhat similarly, in Alsace, had already observed that while in the form of the sexual organs women are more 'primitive,' in the shape of the ears they are less primitive than men. The lobule of the ear, Keith found, tends to be larger in females than in males, and this also may be regarded as a sign of higher development, if we attach any importance to the fact that it is larger in white than in black races.

Darwin's point — the Darwinian tubercle — is less frequently found in women than in men. In the tendency to its disappearance, however, Man is on a par with the higher apes, who also occasionally present it as a reminiscence of descent from the lower apes, in whom it is constant

(as in macaque and baboon). Keith found Darwin's tip among 12 per cent men and 4 per cent women in Peterborough, and in 14 per cent men and 7 per cent women in Ireland at Cork. Schwalbe in Alsace and Schaeffer in Bavaria and Swabia, while finding it much more frequent in both sexes, both find it rarer in women. It is evident that different observers have different criteria for establishing the presence of this anomaly for Schaeffer finds it much commoner in England than in Germany in spite of his high figures for Germany. But all observers seem to find it less common in women.

Gradenigo finds the ear normal in 56 per cent men, in 66 per cent women; he finds every abnormality, even adherent lobule, more common in men. Vali has found every abnormality with the exception of adherent lobule more common in men. Warner, in an extensive investigation of English school children, finds abnormal ears very much commoner in boys than in girls. Lannois's investigations show the proportion of normal ears to be 28 per cent in men and 41 per cent in women. The prominent outstanding ear (*ad ansa*) is everywhere more common in men (11 per cent males and 3 per cent females, according to Gradenigo); it is usually associated with a large mastoid process. Wildermuth's ear (antihelix projecting beyond helix) is usually found to be more frequent in women. Adherent lobule is also more common in women in the experience of most observers.

If we turn to those congenital variations which are closely allied to mental characters we still find, and in an even more marked degree, that men have a greater tendency to abnormality than women. Left-handedness was found by Ogle to be twice as common in men as in women. Colour-blindness, which has been discussed in a previous chapter, is so typical an instance of a congenital variation markedly more frequent in men than in women, that it is desirable to mention it once more. Strictly speaking, the anomaly is not quite accurately termed 'colour-

blindness,' for it exists in various forms and degrees, and in its most usual forms only one of the three variables of colour vision (red, green, and blue) is absent. So that a committee of the British Association reported in 1927 that it was desirable to replace the term 'colour-blindness' by 'hypochromatism.' The person affected by the anomaly in its usual form is a 'dichromat.' The anomaly is instructive because while, in its complete form, it is a typical anomaly significant of sexual variation, it may also be said to blend at the periphery with those variabilities in discrimination of one or other colour which are not abnormal, but come within the normal range; much in the same way as (we shall see) in the psychic field the anomaly of 'genius,' outside the normal range, may blend with those variabilities of 'talent' which comes within every normal series.

Albinism, or congenital absence of pigmentation, is another typical variation which appears to be everywhere more prevalent among men than among women; in Europe there are three males to two females; among many savages the proportion of females is still smaller. There are nearly everywhere more male than female deaf-mutes; thus in Scotland 100 men are deaf-mutes to 79 women; in Germany the proportion is about 100 males to 85 females; in Norway, according to Uchermann, for every 100 deaf-mute males there are only 78 females. Only about 50 per cent cases of deaf-mutism are of congenital origin, but the male preponderance is equally marked both in congenital and acquired cases.

Idiocy and imbecility possess great significance as forms of congenital mental variability, and are probably to some extent mixed up with other forms of mental variability with which they are far from having any obvious relationship. Idiocy is almost everywhere recognised as more common in males than in females; Mitchell estimated the proportion as 100 males to 79 females in Scotland. The Prussian census shows that precisely the same proportion of idiots are born in that country; in France the proportion

is 100 males to only 76 females. Langdon Down some years ago found that the ratio in which the sexes are afflicted is 2.1 to .9, and this is about the proportion in which the sexes are found in idiot asylums to-day in England — a somewhat larger proportion of males than among idiots in the general population. Endemic cretinism, a particular form of idiocy in which there is degeneration of the thyroid gland, is also more common in males, in the proportion, according to Lunier, of 5 to 4, varying, however, according to the region.

Criminality and the tendency to suicide usually tend to arise on a basis of congenital abnormality as a predisposing cause, although the actually exciting cause may be social stress, and are on the whole more prevalent in men than in women.[1] That form of insanity which is sometimes called 'moral insanity,' or perhaps more properly 'moral imbecility,' is an inborn abnormality, and is far more common in males than in females. The 'crank', again, whose whole life pursues an eccentric and futile orbit of its own, is a congenitally abnormal person although his abnormality may not develop until late; the crank is very rarely a woman, although the milder type, the 'faddist,' is perhaps as often a woman as a man; this fact is doubtless part of the general affectibility of women under the influence of minor stimuli, according to which, for instance, while women more often suffer from indigestion than men, the latter much more often suffer from cancer of the stomach. Similarly, nearly all extreme and pronounced forms of sexual perversion, such as we may probably though not certainly regard as based on constitutional anomaly, are much more frequently found in men; of 198 cases recorded in detail in Krafft-Ebing's

[1] In general there are about three men suicides to one woman, though more women than men attempt suicide. The only age at which women suicides frequently outnumber men is between 20 and 30. As regards criminality, we find, for instance, in Chicago, that in the main groups of young repeated offenders the sexual proportion is 1 to 2.3. (W. Healy and Augusta Bronner, *Delinquents and Criminals*, 1926.)

Psychopathia Sexualis only 11 per cent were women. Nearly all the famous cases of sadists are men. Erotic fetichism in a marked form is so rare in women that Stekel, on a wide experience, states, too positively, that it is never found in them.[1] But when we take these tendencies as they occur, not in an extreme and morbid form in persons who are abnormal, but within the range of normality, we find that they are all — erotic fetichism, sadism, masochism, etc. — frequent in both sexes, though usually more frequent in men.[2]

To turn to more intellectual but still undoubtedly congenital forms of mental abnormality, we may take arithmetical prodigies; Dr. Scripture studied these with some fullness. Taking into account all those of whom we have record, from Nikomachus down, he finds not less than twenty-one men to one woman — Lord Mansfield's daughter, who almost equalled Colbourn. Two calculators of the first rank who appeared since Scripture wrote, Inaudi and Diamandi, serve to increase the male proportion.[3] While a few distinguished men, like Ampère and Gauss, are to be numbered among arithmetical prodigies, this abnormality is by no means due to education, and is sometimes found in uneducated persons who are almost idiots. Scripture gives further references to extraordinary memory for figures, though not strictly of calculation. All the examples given are men.

The arithmetical prodigy leads us up to the most interesting of all forms of psychic abnormality, that which we usually call 'genius.' When understood as an abnormality genius stands in opposition to what is commonly called 'talent.' Here we encounter the difficulty so often met in the attempt to delimit scientifically natural groups. A dis-

[1] Stekel, *Der Fetischismus*, 590.

[2] Exact percentages among 100 men and 100 women of high standing are given by Dr. G. V. Hamilton in his valuable work, *A Research in Marriage*, chap. XVIII.

[3] E. W. Scripture, *Am. Jour. Psych.*, April, 1891. We have also, however, to add Diamandi's sister, Uranie, *Arch. de Psychol.*, Sept., 1913.

tinction of this kind seems to superficial observation simply empirical or even merely verbal. It is always troublesome to realise that natural groups have nuclei at the centre, but no definite boundary at the periphery. It is more than usually troublesome when faced by that opposition between 'genius' and 'talent' which all accept, but none are completely agreed about. The man of 'genius' has discovered a way of doing things so new, and so far beyond the familiar ways, that he stands apart from his fellows and often in seeming opposition to them; he is therefore abnormal. The man of so-called 'talent,' possessing a general ability and a ready facility in which the man of genius may be completely lacking, stands with his fellows and does the same things that they do, but more skilfully than on the average they are able to do; he is therefore within the normal range. The distinction between these two natural groups is at the centre entirely clear but the two groups so largely overlap that there is no clearness at the periphery. This is known to all who have dealt with the subject, and we are not here called upon to attempt any new analysis.

We may therefore regard genius as an organic congenital anomaly (although the evidence in proof of this cannot be entered into here), and in nearly every department it is, undeniably, of more frequent occurrence among men than among women. The statement of this fact used sometimes to be regarded by women as a slur upon their sex; they sought to explain it by lack of opportunity, education, etc. It does not appear that women were equally anxious to find fallacies in the statement that idiocy is more common among men.[1] Yet the two statements must be taken together. Genius is more common among men by virtue of the same general tendency by which idiocy is more com-

[1] Leta Hollingworth, however, in New York, argues (*Medical Record*, 25 Oct., 1913) that if a greater social pressure were placed on women the female population of institutions for the feeble-minded would increase; and Cyrus Mead in Indiana finds (*Ped. Sem.*, 1914, p. 394) that feeble-minded girls more nearly approximate to normal girls than feeble-minded boys to normal boys, and therefore are less likely than the boys to be placed in institutions.

mon among men. The two facts are but two aspects of a larger zoölogical fact — the greater variational range of the male.

'There are no women of genius; women of genius are all men.' This saying of Goncourt's has been quoted far more frequently than it deserves to be. It is only imperfectly true, since many women of genius have been of entirely feminine organisation, and in so far as it is true it is without point, for the reason that while many women of genius have shown masculine qualities, many men of genius have shown feminine qualities. The real truth is conveyed in the wider statement that in persons of genius of either sex there is a tendency for something of the man, the woman, and the child to coexist. It is not difficult to understand why this should be so, for genius carries us into a region where the strongly-differentiated signs of masculinity or femininity, having their end in procreation, are of little significance.

With reference to the argument, so often uncritically brought forward, that women have had no opportunity to show genius, Ellen Key well remarks: 'It is forgotten that for more than a thousand years, all over Europe, the cloister delivered women from the fetters of the hearth and the family, and it was certainly the most gifted and developed women who sought the cloister. No prejudice hindered them from devoting themselves to science, art, and literature; in fact, they so devoted themselves. Yet all the famous names in the annals of the cloister are men's names, with the exception of Hroswitha, and that age only produced one great feminine genius, the Swedish Birgitta.' [1]

[1] Ellen Key, *Misbrauchte Frauenkraft*, 13, and see L. Eckenstein, *Woman under Monasticism* (1896). Special mention should, however, be made of Saint Hildegard of Bingen in the twelfth century. See, e.g., C. Singer, *Studies in the History and Methods of Science* (1917), 1–55, and *Arch. f. Frauenkunde*, XIV (1928), 366. Hildegard, as Singer sums her up (*Brit. Med. Jour.*, 7 Nov., 1925, p. 869), 'was very far from being a saint in any intelligible sense of the word. Yet despite her faults she was a fine and fiery, and exceedingly able and courageous woman.' Her writings show much originality, and are by no means orthodox.

In the sphere of talent women have in the past been hampered by lack of opportunity, and to some extent are still, because the professions have been closed to them. But genius is not attracted to the professions which, indeed, for the most part, have always rejected it with horror. In the sphere of genius men have to contend with just as many obstacles as women. It may even be argued that in this field women are better fitted to elude obstacles, and have so approved themselves, than are men. If we turn to the art in which women have most clearly shown themselves to be more than the equals of men in genius, the dramatic art, it will be found that women have been nowise more favoured by opportunity than men. Many of the most famous actresses have started from the lowest social levels and encountered almost incredible difficulties. One of the greatest of actresses, Clairon, in her autobiographical memoir, has drawn a vivid picture of the obstacles of every kind which she had to surmount in order to reach the stage, and afterwards in order to attain success, and many other great actresses could have told similar stories.

It cannot be too clearly and firmly stated that the special quality denominated 'genius' — as well as the corresponding quality, idiocy — while by no means confined to one sex, is yet predominantly associated with one sex. This is an organic tendency which it is possible to catch a glimpse of throughout our discussion of sexual differences in intelligence (Chapter XIV), as well as in the consideration of differences in artistic aptitude (Chapter XIII). It is indicated in the suggestive investigations of Ivanoff in Geneva, showing how among ordinary school children the aptitude for drawing is an aboriginal instinct not correlated with general intelligence, while in girls, as nearly all investigations show, the qualities of intelligence are, in a higher degree than in boys, all impartially under the influence of impulses that are primarily emotional, and secondarily practical.

It thus comes about that women, although in qualities of

docility and receptivity they may often be more than the equals of men, possess less spontaneous originality in the intellectual sphere. This is an organic tendency which no higher education can eradicate. As a matter of fact, the higher education of women is no more apt to evolve genius in women than it is in men, and perhaps less so. 'While we see feminine culture carried to an exceptionally high level,' concludes Miss Wordsworth of Lady Margaret Hall, Oxford, 'and with many very gratifying results, we do not, so far as we can judge, see much indication of the discovery of great original power amongst women, either in the department of mechanical and scientific invention, musical or poetical composition, philosophic thought or historical *chefs-d'œuvre*. In the one department in which they confessedly show originality — that of fiction — they have been very little indebted to the 'higher education,' as may be seen by recalling the names of our greatest women writers.' [1]

It should not be necessary to repeat that no inferiority is hereby attributed to women. It is perhaps even possible to attribute an equality of genius to women if we are prepared to recognise that quality outside the spheres of art and science in the wider sphere of concrete practical life. We have to recognise not only that women have proved the equals of men in the novel and on the stage, and in the interpretative arts, but that in two spheres they have proved the superiors of men: (1) in the sphere, involving high intellectual aptitudes, of social work, for which women's organic qualities specially fit them, and wherein such a figure as that of Florence Nightingale has not been equalled by any man, and (2) in the spheres of love and of the family, for it is quite possible to show genius in love, and it is not a kind of genius in which men have often equalled women. Heymans, who takes substantially this

[1] The same holds good in America, and Amanda Northrop, examining *Who's Who in America* ('The Successful Women in America,' *Pop. Sci. Monthly*, Jan., 1904), found that only 15.5 per cent of American successful women are college trained.

view, remarks: 'Here we find in full operation what we have sought so long and with such small result in science and art: *feminine genius*. And this feminine genius is neither of other kind or of less perfection than masculine genius; it is merely directed on other objects, the objects towards which woman's strongest and most enduring interests tend.'

We have seen in a previous chapter, when considering what I have termed 'affectibility,' that on the surface women appear more sensitively responsive to delicate stimuli, more apparently unstable than men. But so delicately poised are natural phenomena that this tendency is duly balanced on the other side. From an organic standpoint, women represent the more stable and conservative element. It is a metaphorical as well as a literal truth that the centre of gravity is lower in women and less easily disturbed. In various parts of the world anthropologists have found reason to suppose that the primitive racial elements in a population are more distinctly preserved by the women than by the men. Lagneau remarked with reference to the Saracenic element in France, to the Basques and to some other races, that the women seem to preserve ethnic peculiarities better than the men. Dally made some observations to the same effect. Jacobs remarks: 'I seem to observe that Jewesses have more uniformly what we term the Jewish face than Jews have.' The men of Arles — of old, the Gallic Rome — are of very ordinary physical character; the women of Arles, on the contrary, are famous for their beauty; they are like Italians, with pale faces, black hair, and noble carriage; it is probable that they recall the characters of the population of Arles when that decayed and crumbling place was a city of palaces. In the same way the infusion of Spanish in the Flemish, due to Spanish domination during the sixteenth century, is, as Coucke remarks, best seen in the hair, eyes, complexion, and hips of some of the women near Bruges. It may be said generally that traces of the

primitive Mongoloid elements in the so-called 'Celtic' race are everywhere more apparent in the faces of the women than of the men; various observers have noted this in Brittany, Morvan, etc., and I have myself observed it in Savoy and in Cornwall. Mantegazza has remarked that at Cortona and Chiusi the women recall the ancient Etruscans, and at Albano the ancient Romans, more than do the men. Sykes says of the gipsies of Persia that 'the men cannot easily be distinguished from the surrounding peasantry, but the women dress differently, while their features are certainly not those of the Persian peasant.' [1] The Giao-Chi, an ancient race regarded by the Annamites as their ancestors, are remarkable for the position of the big toe, set at a considerable angle to the foot, and almost opposable to the other toes. Notwithstanding a very large amount of mingling with other races, this atavistic peculiarity is still met with in the Tonquin delta, says Dumoutier, more especially among the women.[2] It is thought by some that the smaller size of women as compared to men is connected with the preservation of a primitive character. Zoölogists believe that the early or ancestral members of a group are of small size, and that the study of the smaller members within given groups of animals promises the best results as to their phylogeny. Women by their smaller size approximate to the probably smaller stature of Man's ancestors.

On the psychic side women are more inclined than men to preserve ancient customs and ancient methods of thought. In Russia spells and other primitive methods of solving the difficulties of life are in the hands of women who have a recognised position as witches and soothsayers. In Sardinia, Sicily, and the remote valleys of Umbria many ancient beliefs and pagan rites, which are perhaps of even prehistoric character, are still preserved by women. In the island of Lewis Sir A. Mitchell found that *craggons* (globular pots of very primitive shape) were still made by women,

[1] Sykes, *Jour. Anth. Inst.*, 1902, p. 344. [2] *L'Anthropologie*, Nov., 1890.

working with their hands, in the prehistoric manner. Archæologists carrying on excavations in remote districts of the north of Scotland have repeatedly found that the women, still inspired by pagan feelings, have dissuaded their male folk from giving assistance. In some parts of France artificial deformation of the skull still persists. It appears that in Normandy, Limousin, Languedoc — wherever the custom persists at all — boys wear the bandages for but a short time; with girls and women the custom is lifelong. All forms of astrology are now chiefly supported by women, although at one time they were equally sought after by both sexes; Edgar Lee, who answered nearly thirteen thousand astrological queries, found that 70 per cent of the inquirers were women who wished to know if they were going to be married; it should be added that they belonged chiefly to the middle and upper classes. The circular dancing and singing games of children (such as 'Nuts in May'), which are believed to be survivals of primitive sacred dances once performed chiefly by men, are now preserved by girls alone.[1]

We have, therefore, to recognise that in men, as in males generally, there is an organic variational tendency to diverge from the average, in women, as in females generally, an organic tendency, notwithstanding all their facility for minor oscillations, to stability and conservatism, involving a diminished abnormality.[2] It may not be out of place to add that in emphasising the variational tendency in men, the conservative tendency in women, we are not

[1] Groos, *Spiele der Menschen*, 452; Haddon has a full and interesting discussion of these games in reference to their primitive character, *Study of Man*, chaps. XI–XV.

[2] On the psychic side it is sometimes said, as long since by Burdach, that when women vary, they tend to vary more intemperately than men. Thus Dr. Barnardo, as a result of long experience, remarked that in regard to depraved habits and depraved talk 'the girls are always much worse than the boys. I have had no such degree of depravity with boys as with girls.' Inebriety, again, according to Norman Kerr and other authorities, is more curable in men than in women. Cruelty, again, as well as pity, seems more marked in women than in men. These and similar phenomena are not, however, strictly speaking, manifestations of any variational tendency, but simply the results of the greater affectibility and exhaustibility of women.

talking politics, nor throwing any light on the possible effects of the changes now going on in the status of women. It is undeniably true that the greater variational tendency of the male is a psychic as well as a physical fact, but zoölogical facts cannot easily be brought within the small and shifting sphere of politics. Organic conservatism may involve political revolution. Socialism and nihilism are not usually regarded by politicians as conservative movements, but, from the point of view of the race, they may be truly conservative, and, as is well known, these movements have powerfully appealed to women. Women opposed the French Revolution. 'If it were not for women,' it was said, 'the Republic would be safe;' but, on the other hand, the establishment of Christianity, the most revolutionary movement that has ever been seen in Europe, was to a considerable extent furthered by women, while the Russian Revolution, the most significant and far-reaching revolutionary movement of recent times, was aided by women and has generally enlarged their influence; nowhere are women so active in public life as in Russia. It is difficult to argue from zoölogical facts to an order of facts which is of purely local and temporary character. The mistake is often made, and it is, therefore, not out of place to refer to it here.

It is by virtue of this organic conservatism that while the male tends to wander abroad, the female remains within the circle of her own interests. Man is a rover, as Briffault expresses it; woman is stationary. Or, as a more ancient saying has it: 'A man's home is the world; a woman's world is the home.' Thus it comes about that vagabondage, the wandering or nomadic impulse, is a masculine trait.[1] And this psychic difference is deeply rooted in the physical texture of the whole animal race whence Man sprang. 'In all that concerns the evolution of ornamental characters,' remarks Pycraft, 'the male leads.

[1] Briffault, *The Mothers*, I, 257; Davenport, *The Feebly Inhibited: Nomadism*, 20.

In him we can trace the trend which evolution is taking; the female and young afford us the measure of the advance along the new line which has to be taken. Sooner or later the females assume all the features originally possessed by their lords; and finally the young also follow suit. That is to say, the females and young tend to retain the ancestral characters. In the course of time the ability to develop new features by the male loses its impetus, and not till then, apparently, do the female, and still later the young, begin to share his glory.' [1]

A large part of the joy that man and woman take in each other is rooted in this sexual difference. The progressive and divergent energies of men call out and satisfy the twin instincts of women to accept and follow a leader, and to expend tenderness on a reckless and erring child, instincts often intermingled in delicious confusion. And in women men find beings who have not wandered so far as they have from the typical life of earth's creatures; women are for men the human embodiments of the restful responsiveness of Nature. To every man, as Michelet has put it, the woman whom he loves is as the Earth was to her legendary son; he has but to fall down and kiss her breast and he is strong again. Woman is more in harmony with Nature than man, as Burdach said, and she brings man into harmony with Nature.[2] This organically primitive nature of women, in form and function and instinct, is always restful to men tortured by their vagrant energies; it was certainly with genuine satisfaction that the tender and sympathetic Diderot wrote of women that 'they are real savages inside.' It is because of this that the ascetics, those erratic and abnormal examples of the variational tendency, have hated women with hatred so bitter and

[1] W. P. Pycraft, *The Courtship of Animals*, 9. This observation on ornamental characters must not be too widely generalised.

[2] Nietzsche (referring to Plato's views of women) has made almost precisely the same remark: 'Woman is more closely related to Nature than is man. . . . In her being lies the healing strength, the beneficent rest which restores spent energies.' (*Werke*, Bd. IX, 115.)

intense that no language could be found strong enough to express their horror. They knew that every natural impulse of a woman is the condemnation of asceticism. All true lovers of the artificial and perverse find woman repulsive; 'Woman is natural,' it is written among the sayings of Baudelaire, 'that is to say abominable.' But for most men and women this sexual difference has added to the charm of life: it has also added to the everlasting difficulty of life.

CHAPTER XVI

CONCLUSION

The knowledge we have gained does not enable us definitely to settle special problems — What it does enable us to do — Woman is not undeveloped man — The significance of the child in evolution — The progress of the race a progress in youthfulness — In some respects a progress in feminisation — No superiority of one sex over another — The sexes perfectly poised — But social readjustments always necessary — We may face such readjustments with equanimity.

We have examined Man and Woman, as precisely as may be, from various points of view. It is time to pause, as we do so bringing together a few general observations suggested by the multifarious facts we have encountered.

It is not possible to assert definitely that we have reached the end proposed at the outset. We may not have succeeded in determining the radical and essential characters of men and women uninfluenced by external modifying conditions. Sometimes a sufficiently wide induction of facts (as in the question of the alleged sexual differences in respiration) suffices to show us what is artificial and what is real; at other times (as in the question of differences in sensibility) the wider our induction of facts the more complex and mobile become our results. We have to recognise that our present knowledge of men and women cannot tell us what they might be or what they ought to be, but it tells us what they actually are, under the conditions of civilisation and what they are tending to become. By showing us that under varying conditions men and women are, within certain limits, modifiable, a precise knowledge of the actual facts of the life of men and women forbids us to dogmatise rigidly concerning the respective spheres of men and women. It is a matter which experience alone can demonstrate in detail. If this is not exactly the result which we set out to attain, it is still a result of considerable importance. It lays the axe at the root of many pseudo-

scientific superstitions. It clears the ground of much unnecessary verbiage and fruitless discussion, and enables us to see more clearly the really essential points at issue. The small group of women who wish to prove the absolute inferiority of the male sex, the larger group of men who wish to circumscribe rigidly the sphere of women, must alike be ruled out of court. Nor may we listen to those would-be scientific dogmatists who on *a priori* grounds, on the strength of some single and often doubtful anatomical fact, lay down social laws for mankind at large. The ludicrous errors of arrogant and over-hasty brain anatomists in the past should alone suffice to teach us this caution. The facts are far too complex to enable us to rush hastily to a conclusion as to their significance. The facts, moreover, are so numerous that even when we have ascertained the precise significance of some one fact, we cannot be sure that it is not contradicted by other facts. And so many of the facts are modifiable under a changing environment that in the absence of experience we cannot pronounce definitely regarding the behaviour of either the male or female organism under different conditions. There is but one tribunal whose sentence is final and without appeal. Only Nature can pronounce concerning the legitimacy of social modifications. The sentence may be sterility or death, but no other tribunal, no appeal to common-sense, will serve instead.

Yet there are certain general conclusions which have again and again presented themselves, even when we have been occupied in considering very diverse aspects of the physical and psychic phenomena of human life. One of these is the greater variability of the male; this is true for almost the whole of the field we have covered, and it has consequence of wide significance. Another general conclusion of an equally far-reaching character is the precocity of women, involving greater rapidity of growth and its earlier arrest than in men. The result of this precocity is that women, taken altogether, present the

characters of short men, and to some extent of children. The whole organism of the average woman, physical and psychic, is, throughout, unlike that of the average man, on account of this fact alone. The differences may often be of a slight or subtle character, but they are none the less real, and they extend to the smallest details of organic constitution. We have found over and over again that when women differ from men, it is the latter who have diverged, leaving women nearer to the child-type. The earlier arrest of development in women is thus connected with the variational tendency of men. And all these sexual differences probably have their origin in the more intimate connection of women with offspring.[1]

This general character of woman's organic development has long been recognised.[2] Its significance has by no means been so clearly recognised. To assume, as Herbert Spencer and many others have assumed, that on this account woman is 'undeveloped man,' is to state the matter in an altogether misleading manner. That the adult man diverges to a greater extent from the child-type than the adult woman is on the whole certainly true — though even this is not entirely true of the more primary sexual organs and functions — and, so far as it is true, it is a fact not merely of human life, but of animal life generally. To add, however, that woman is undeveloped man is only true in the same sense as it is to state that man is undeveloped woman;

[1] Further evidence on this point may be found in the statistics of disease. It is difficult to find diseases that are common in children and men and rare in women, and still more difficult to find diseases that are rare in children and men and common in women. On the other hand, it is very easy to find diseases which are common in children and women and rare in men, and diseases which are rare in children and women and common in men.

[2] Topinard considered that, structurally, woman is intermediate between the child and the adult man; this is not strictly correct, as in some respects women are farther removed from the infantile state than are men. Dr. H. Campbell (*Nervous Organisation of Man and Woman*, chaps. VIII, IX) has an interesting discussion of this question. Giuffrida-Ruggeri (*Monit. Zoolog. Ital.*, 1903, no. 12), criticising my conclusions on this point, argued that the infantile characteristics of women are 'coincidences.' It is legitimate so to regard them, provided we recognise that they are highly significant coincidences.

in each sex there are undeveloped organs and functions which in the other sex are developed. Yet it remains true, without possibility of doubt, that, as Giuffrida-Ruggeri lays down, 'each sex is in all its characters perfectly adult.'

In order to appraise rightly the significance of the fact that women remain somewhat nearer to children than do men, we must have a clear idea of the position occupied by the child in the human and allied species. In Chapter II, I alluded to the curious fact that among the anthropoids the infant ape is nearer to Man than the adult ape. This means that the infant ape is higher in the line of evolution than the adult, and the female ape, by approximating to the infant type, is somewhat higher than the male. Man, in carrying on the line of evolution, started not from some adult male simian, but from the infant ape, and in a less degree from the female ape. The human infant bears the same relation to his species as the simian infant bears to his, and we are bound to conclude that his relation to the future evolution of the race is similar.[1] The human infant presents in an exaggerated form the chief distinctive characters of humanity — the large head and brain, the small face, the hairlessness, the delicate bony system. By some strange confusion of thought we usually ignore this fact, and assume that the adult form is more highly developed than the infantile form. From the point of view of adaptation to the environment it is undoubtedly true that the coarse, hairy, large-boned, and small-brained gorilla is better fitted to make his way in the world than his delicate offspring, but from a zoölogical point of view we witness anything but progress. In Man, from about the third year onwards, further growth — though an absolutely necessary adaptation to the environment — is to some extent growth in degeneration and senility. It is not carried to so low a

[1] It may be argued, in explanation of the phenomena, that the ape has descended from a more human ancestor, but there is no ground for such an assumption.

degree as in the apes, although by it Man is to some extent brought nearer to the apes, and among the higher human races the progress towards senility is less marked than among the lower human races. The child of many African races is scarcely if at all less intelligent than the European child, but while the African as he grows up becomes more obtuse, and his social life falls into a state of routine, the European retains much of his childlike vivacity. And if we turn to what we are accustomed to regard as the highest human types, as represented in men of genius, we shall find an approximation to the child-type. 'You Greeks are always children'; such was the impression given by the ancient people whom we are sometimes taught to regard as the highest type the world has reached. According to the formula of an old mystic, the reign of the Father gave place to the reign of the Son, which must be succeeded by the reign of the Holy Ghost. It might be said that this formula corresponds to a zoölogical verity. The progress of our race has been a progress in youthfulness.[1]

We may now see how it is that woman's special sphere is associated with her function as the guardian of the progressive youthfulness of the race, alike in her own person as in the child she conceives and bears and tends. In various foregoing chapters it has been shown how the organic differences which distinguish the sexes indicate in no uncertain way that woman's prime, though by no means exclusive, work centres in her maternal function, and is constitutionally apt to be largely of maternal nature, even when the maternal function itself is not exercised.[2] This tendency is seen in its extreme form in mental hospitals where the return of affection or pity is often the first sign of recovery in female mental patients. 'It was not

[1] The facts encountered in our consideration of the cephalic index, for example, are interesting from this point of view.

[2] This is so even in lower animals. Thus (as Blair Bell reports) a bitch, which had not been allowed access to a dog during the period of heat, yet, at the correct period for pregnancy to terminate, made a nest for her young ones, although there was no ground for the expectation of them.

easy,' remarks Dr. Elizabeth Casson,[1] 'to provide suitable stimuli for the maternal instinct in a mental hospital. Babies were scarce, and except for fellow patients there was no one to mother. Dogs and cats were the best substitutes. Where they could not be persuaded to mother people, patients might be able to express the allied instinct of nest-building and home-making in crafts and other branches of occupational therapy. An instinct might be abnormal in its unusual strength — for example, in cranks who kept twenty cats or pestered their friends for subscriptions to antivivisection societies. It might be aroused by an abnormal stimulus, or express itself unusually — Mrs. Jellyby (in 'Bleak House') was a notable example. A patient who had lost a baby, or had been nursing some other relative who had died, might thereafter lavish upon herself all the care and attention she had been giving to the child. Sometimes when the instinct was unsatisfied or repressed, the patients lost all touch with reality: they had babies in fantasy; in a mental hospital one might find an old dement gently nursing a pillow. One patient, who had been aggressive, noisy, and abusive, became a different person when she was given a doll.'

When women enter the same fields as men, on the same level and to the same degree, their organic constitution usually unfits them to achieve the same success, or they only achieve it at a greater cost.[2] Woman's special sphere is the bearing and the rearing of children, with the care of human life in the home. Man's primary sphere remains the exploration of life outside the home, in industry and inventions and the cultivation of the arts. She gives her

[1] 'Medical Aspects of the Maternal Instinct,' *Brit. Med. Jour.*, 2 April, 1927.

[2] 'To achieve this [the masculine occupational] standard,' Dr. Jane Suttie truly observes, 'not to speak of outstripping it, the woman must always expend more effort than the man, for, as well as among other difficulties, she must always overcome at least the inertia of the interest she has suppressed.' There result division of interest, psychic conflict, weakening of motive, and the need of increased effort to reach the standard of achievement demanded in the new occupational career. Weichbrodt (*Der Selbstmord*, 1923) traces the relatively greater increase of suicide among women in modern times to the increased proportion of women in trades and professions.

time to man and to the rearing of his children, while he is inspired by her to roam abroad, bringing back the bright playthings of his inventions and arts. All that we have found in our long course of investigation is in harmony with this primitive and fundamental distinction between the two main spheres of masculine and feminine activity. While the woman has no more reason for feeling herself a mere 'breeding machine' than the man has for thinking himself a mere 'provender machine' — though so many are little but that — yet, reduced to its simple natural elements, to which there is no need to reduce it, that is the naked natural fact, whatever deviations may follow. Woman breeds and tends; man provides; it remains so even when the spheres tend to overlap. This is demonstrated over and over again from all parts of the world, among all kinds of races, in every period, under any civilisation.

That fundamental fact may sometimes seem to have been overlooked in our discussion, because we have been concerned with the secondary and tertiary, and not with the primary, characters of sex. We have, for a large part, been trying to see how women show, as compared with men, when we disregard, so far as may be, their special reproductive function and place them on the same footing as men, a footing which in our civilisation they are constantly called upon to assume, whether before their reproductive life begins, or after it is over, or — as in so large a body of women in civilisation — when they renounce altogether the exercise of the actual reproductive function. No doubt there are many gynecologists who, in their excessive anxiety to safeguard the reproductive function, set their faces against any participation by women in work or occupation that can be called masculine or in any fields where men had laid down the conditions of work and where women, when they enter, are called upon to compete on the basis of their different feminine organisation with men.[1]

[1] 'It is reasonable to believe from the evidence at our disposal,' states Blair Bell (*The Sex-Complex*, 122), 'that the application of feminine talents to

But under our modern social conditions it is difficult to see how women can be prevented from entering, in some form or another, into what may be considered competition with men. Such competition is everywhere at work in civilisation. It is inevitable at the present stage. It was worth while to show, as in the foregoing chapters has been amply shown, that women may acquit themselves honourably in such competition, sometimes equalling men, occasionally surpassing them.

At the same time we must always have at the back of our minds, if we are not to be led astray, the fundamental fact that the division into two sexes came about in the course of evolution only as a method of favouring reproduction. The sexual method thus introduced meant that the actual burden of offspring should fall especially on one sex. It is possible for us, in some degree, to over-ride that dispensation by refraining from reproduction or by confining the reproductive period within narrow limits. But it is only in some degree that this can be effected. We are still dealing with two organisms that have been constituted, and which must remain constituted, whatever we do or refrain from doing, for their respective function in that work of reproduction which is of such primary importance in Nature's eyes. Thus it is that women are inevitably handicapped when they run a race with men in any field of activity which men have made their own, and even when they win they do so at a greater cost than men incur. Moreover, as Manouvrier well said, what women are qualified to do *better* than men cannot fail to be connected, more or less directly, with the totality of their special feminine adaptations.[1]

At the same time the conclusion to which the trend of modern civilisation leads us — which is also the conclusion

the competitive work in which men are engaged, which is strictly speaking an evolutionary form of the hunter's craft, is adventitious and injurious to the psychical and physical functions connected with the biological life of women.'

[1] Manouvrier, *Revue de l'École d'Anth.*, 1909, p. 53.

we have been brought to in the present volume — involves a greater degree of approximation of the masculine and the feminine spheres than has ever been known before in our phase of civilisation. In this approximation women have been the natural pioneers, not so much by any variational deviation from their own path as by acquiring the power to regulate in a greater degree than before the conditions of their own life, instead of accepting masculine regulations, and by at the same time employing in a fuller measure their own feminine aptitudes. Women are no longer entirely absorbed in the function of reproduction, completely secluded in the home which thus became an asphyxiating influence, and shut out from professions and employments reserved for men though in early ages they were exercised by both sexes. Such a sexual division of functions may have had good aspects, but it also had bad effects, impoverishing both masculine and feminine activities, and, in any case, it has not only ceased to exist, but in our civilisation it has ceased to be possible. Women no longer need to devote so large a part of their life and energies to reproduction, perhaps bringing into the world half a dozen children of whom only two survived. The economy of reproduction which under improved conditions of hygiene and health has come about — whether or not entirely due to the action of birth-control — has given greater freedom to women and conferred on them a greater control of their own energies. They have been enabled not only to enrich the masculine or supposedly masculine activities of life by contributing to them their special feminine aptitudes, but by what they have learnt in the masculine sphere they have enriched their own feminine world, enlarging the home and gaining a better preparation for the peculiarly feminine functions of maternity and child-training. The activities of men and women are thus brought into a more harmonious and wholesome relationship, provided only that in all such adaptations the fundamental natural constitution of each sex is duly guarded and preserved.

To ignore these fundamental natural conditions, however, as often in the past by the stress of industrial conditions, is disastrous for women, and what is disastrous for women is disastrous for the whole race of which women are the mothers. Even when it cannot be said to be actually disastrous it exerts an injurious influence which disturbs the whole social balance. This has been conspicuously witnessed when women are submitted to unwholesome industrial conditions devised in the first place for men, and harmful even to them, though not in so pronounced and demonstrable a way as to women. Thus in Sweden, where statistics are among the best produced, going back for a long period, and where there is a great and rising industrialism (in 1919 over 66 per cent of the women of employable age were actually employed), many instructive tendencies may be observed. Swedish authorities, Dr. Greenwood remarks, hold that this rising industrialism is specially prejudicial to the mortality of young adults, and above all of young women; it is found to be so even more outside than inside the towns.[1] Dr. Edin of Stockholm has further been able to make some remarkable investigations into the comparative fertility and infant mortality of the industrial workers as compared with the higher social class for the years 1919–1922, and finds that the fertility is about 25 per cent lower among the industrial workers (33 per cent when comparing young women only in each class) as compared to the upper class, while their infantile death-rate was 26 per cent higher than that of the upper social class.[2]

The results of unregulated industrialism, while injurious for women in general,[3] are necessarily seen at their worst in connection with pregnant women and their offspring.

[1] Greenwood, 'Vital Statistics of Sweden and England,' *Jour. Statistical Soc.*, 87 (1924), 525.

[2] K. A. Edin, 'Fertility in Marriage in Stockholm,' *Proc. World Population Conference* (1927), 205.

[3] Thus in Germany during the Great War, for instance at Leipzig, it was found that women in industry suffered to a far greater extent than men from weakness and exhaustion. Scheider, *Arch. f. Frauenkunde* (1929), Bd. 15, p. 44.

Even among savages the pregnant woman is frequently treated with care and consideration, although the precautions adopted are often subtly woven in with ideas of taboo. Thus in ancient Maori New Zealand, the woman of chieftain class was not allowed to do any laborious work when pregnant or to carry heavy burdens, but while in this condition was provided with two female attendants.[1] Under the conditions of what is commonly called civilisation it has frequently happened that no attention whatever is given to the pregnant woman; she has been allowed to work as long as she likes under the usual conditions of work; or else she has been summarily dismissed as soon as her condition is discovered, so that women workers anxious to retain their positions, even at all costs to themselves, have looked upon pregnancy as a calamity to be avoided by every possible means.

During the Great War these evils were conspicuously witnessed, but also, here and there, some notable efforts were made to deal with them successfully. Thus in England, at Leeds, under the superintendence of Dr. Rhoda Adamson and H. Palmer-Jones, work-rooms were set up under special conditions for women factory employees who had become pregnant. Graduated and carefully regulated work was here carried on, in accordance with the state of the individual woman, all night work, which is often a severe strain for women even at an early period of pregnancy, being abolished. Pregnancy was no longer regarded as a calamity; the women were eager to be enrolled under the new system, and remained healthy and in good condition. The scheme, moreover, far from being of the nature of charity, was found to be sound business, and the women fully earned their wages.[2]

The tendency to-day in all progressive countries is so to regulate the conditions of work that women are not

[1] E. Best, *Jour. Anth. Inst.*, 1914, p. 128.

[2] 'Report on the Work of a Department for employing Expectant Mothers in a Munition Factory,' *Brit. Med. Jour.*, 21 Sept., 1918.

placed in positions which on account of their special biological organisation are found by experience definitely injurious to their general and reproductive health. There are some high authorities, including numerous prominent feminists, who would desire all such regulations to apply to men equally with women; this represents an attempt, which to many seems retrograde, to attain a sort of equality which worked out evilly for women in earlier days. Women workers themselves seem generally to realise the desirability of special regulations for women's work, although they desire that, whenever it is possible or suitable, men should share in these advantages. This is so not only in the most civilised countries of the West but also in the East, even under the Soviet system of Russia which seems to many to forecast the social organisation of our future civilisation. The full equal rights of women with men have from the first been accepted in the New Russia, and nowhere do women take so prominent a part in public life. But nowhere also is there a more genuine recognition of the biological necessities of women or more ample provision for their special needs.[1]

We may see the survival of the older method of approximately sexual equality under industrial conditions and its disastrous results in Japan. A large proportion of the feminine population of Japan is employed in industry, chiefly in manual work; the important textile industry (which forms the chief element in Japanese exports) is mainly in their hands. In 1923 there were 856,800 Japanese women in factories, one-fourth of them below the age of sixteen, and 55 per cent of them were working a 9 to 12 hours day. Night-work is common, and some of the industries in which there is most night work are those chiefly worked by women, so that the conditions for women are, practically, really worse than for men. The results are such as we might expect. Dr. Teruoka, who

[1] See, e.g., Jessica Smith, *Woman in Soviet Russia* (New York, 1928), chap. X.

speaks with authority, states that at the age of twelve (the lowest factory age) factory girls and school girls are almost alike in height and weight, but after this age the factory girls fall behind, the difference between the two groups increasing every year. Exactly similar results are found to exist as regards the mental development of the two classes.[1]

We here come in contact with that misunderstanding of the doctrine of 'equality of the sexes' which in some minds still survives. When the tradition of the general 'inferiority' of women was still held as an unquestionable dogma, it was felt imperative to preach, as was vigorously and successfully done throughout the nineteenth century, the 'equality' of women. But, strictly speaking, there is no such thing as equality. Not only as between men and women, but as between men and men or women and women, no two individuals are really equal. So that when we speak of the 'equality' of the sexes we have to explain precisely what we mean. This was done in a remarkable book written more than a century ago by the Vicomte J. A. de Ségur, 'Les Femmes, leur Condition et leur Influence dans l'Ordre Social.' 'The object of my work,' he states, 'is to prove that the two sexes are equal though different; that there is complete compensation; and that if one sex seems to possess essential qualities that the other lacks, we cannot refuse to that other not less precious qualities which are peculiar to it.' He realised, indeed, with a fine insight, exactly that kind of sexual equality which we are led to regard to-day as the final conclusion of our most detailed investigations. We have, that is to say, as Manouvrier pointed out, to understand 'equality,' not as resemblance, but as *equivalence*. So to understand it, in its precise and significant sense, is to imply a warning against the notion that the two sexes can reasonably be set to work under the

[1] G. Teruoka, *Arch. f. Frauenkunde* (1926), Heft 5. As regards the evil results of factory life in Germany on women's reproductive functions (as by causing defective development of the pelvis) see, e.g., Max Hirsch, *Arch. f. Frauenkunde* (1925), Heft 4.

same conditions. Here, also, it is equivalence, and not equality, of conditions which is demanded.

If this conception of the fundamental equivalence of men and women is clear to us we need not be alarmed at any suggestions — speculative as they may be — concerning the natural position of women, for we shall always find the sexes compensatory. Woman bears the special characteristics of humanity in a higher degree than man (as Burdach pointed out), and led evolution in the matter of hairiness (as Darwin, following Burdach, pointed out), and that, as has clearly been indicated, simply because she is nearer to the child. Her conservatism is thus compensated and justified by the fact that she represents more nearly than man the human type to which man is approximating. This is true of physical characters: the large-headed, delicate-faced, small-boned man of urban civilisation is much nearer to the typical woman than is the savage. Not only by his large brain, but by his large pelvis, the modern man is following a path first marked out by woman: the skull of the modern woman is more markedly feminine than that of the savage woman, while that of the modern man has approximated to it; the pelvis of the modern woman is much more feminine in character than that of the primitive woman, and the modern man's pelvis is also slowly becoming more feminine.

We may note also that, as many investigators have found, the student (to whose type the modern man has approximated) occupies, both physically and mentally, a position intermediate between that of women and ordinary men. Throughout the whole course of human civilisation we see men following women and taking up their vocations, with more energy, more thoroughness, often more eccentricity. In savagery and barbarism men have been predominantly hunters and fighters in character, while our phase of civilisation has been industrial, that is to say, feminine, in character, for the industries belonged primitively to women, and they tend to make men like women.

Even in recent times, and in reference to many of the details of life, it is possible to see the workings of this feminisation; although, it is scarcely necessary to add, this is but one tendency in our complex modern civilisation. It may be pointed out how, even during recent years, there appears to have been a movement amongst men in favour of adopting feminine methods of committing suicide. The active methods of suicide (especially hanging) have in the past been the favourite methods of suicide among men, and the passive methods (especially drowning) the favourite methods among women; in recent times hanging has become much less frequent among both men and women; and drowning more frequent among both. That is to say that while the women remain as 'womanly' as ever, the men have become less 'manly.' We have, again, but to compare the various conveniences of our streets and of locomotion to-day with the condition of the streets of a large city a century ago, or even in many respects thirty years ago, to realise the progress that has been made in affording equal facilities for women with men, and in so doing to make life easier for men as well as for women. In the early Christian world Clement of Alexandria was of opinion that women should be allowed to wear shoes: it was not, he said, suitable for their feet to be shown naked; 'besides woman is a tender thing, easily hurt. But for a man bare feet are quite in keeping.' [1] To-day a man also is a 'tender thing,' and there is less and less inclination to recognise any distinctions of this kind. It would not be difficult, had it been part of my task, to multiply examples of the ways in which women are leading evolution. In the saying with which Goethe closed his 'Faust' lies a biological verity not usually suspected by those who quote it.[2]

[1] *Pædagogus*, Bk. II, Chap. XII.

[2] 'In the progress towards the modern type,' as Sir Arthur Keith remarks (*Ancient Type of Man*, 1911, p. 98), 'children lead the way, women follow, and men bring up the rear.' He points out that even in Neanderthal Man of the Mousterian Period there are sex differences as great if not greater than

The ancient discussion regarding the 'alleged inferiority of women' — as there is no need to make any clearer — has become futile and foolish. If it is a question of determining the existence and significance of some particular physical or psychic sexual difference a conclusion may not be impossible. To make any broad statement of the phenomena is to recognise that no general conclusion is possible. Now and again we come across facts which group themselves with a certain degree of uniformity, but as we continue we find other equally important facts which group themselves with equal uniformity in another sense. The result produces compensation. Thus we find that the special liability of women to be affected by minor vital oscillations is balanced by a special resistance to more serious oscillations; that against the affectibility of women we must place their disvulnerability. Again, the greater proportion of variations among men, while it produces many brilliant and startling phenomena, also produces a greater proportion of worthless or even harmful deviations, and the balance is thus restored with the more equable level of women. In the intellectual region men possess greater aptitude for dealing with the more remote and abstract interests of life; women have, at the least, as great an aptitude in dealing with the immediate practical interests of life. If women seem to remain nearer than men to the youthful state, men seem to approach more nearly than women to the ape-like and senile state. The more clearly and broadly we investigate the phenomena the more emphatically these compensations stand out. It could scarcely be otherwise. A species in which the maternal half exhibited a general inferiority of vital functions could scarcely survive; still less could it attain the somewhat special and peculiar position which — however impartially we may look at the matter — can scarcely be denied to the human species.

in modern races, women showing less massive, robust, and brutish characters than the men. 'Man will approximate morphologically to woman,' says Kramer similarly (*Zt. f. Sexualwiss.*, April, 1920), not the other way about.

From many groups of facts, it is true, one may conclude that the world, as it is naturally made, is a better world for women than for men. Nature, as Humboldt put it, has taken women under her special protection. But so far as this is a fact it is a zoölogical and not a specially human fact. The female animal everywhere is more closely and for a longer period occupied with that process of reproduction which is Nature's main concern. This is, indeed, more than a zoölogical fact; it is a biological fact; among plants we find that the stamens soon fall away while the pistil remains. The female retains her youthfulness for the sake of possible offspring; we all exist for the sake of our possible offspring, but this final end of the individual is more obviously woven into the structure of women. The interests of women may therefore be said to be more closely identified with Nature's interests. Nature has made women more like children in order that they may better understand and care for children, and in the gift of children Nature has given to women a massive and sustained physiological joy to which there is nothing in men's lives to correspond. Nature has done her best to make women healthy and glad, and has on the whole been content to let men run somewhat wild.

Men have had their revenge on Nature and on her *protégée*. While women have been largely absorbed in that sphere of sexuality which is Nature's, men have roamed the earth, sharpening their aptitudes and energies in perpetual conflict with Nature. It has thus come about that the subjugation of Nature by Man has often practically involved the subjugation, physical and mental, of women by men. The periods of society most favourable for women appear, judging from the experiences of the past, to be somewhat primitive periods in which the militant tendency is not strongly marked. [1] Very militant periods, and those so-called advanced periods in which the complicated and artificial products of the variational tendency of men

[1] See, e.g., Briffault, *The Mothers*.

are held in chief honour, are not favourable to the freedom and expansion of women. Greece and Rome, the favourite types of civilisation, bring before us emphatically masculine states of culture. The lust of power and knowledge, the research for artistic perfection, are usually masculine characters; and so most certainly are the suppression of natural emotion and the degradation of sexuality and maternity. Morgan believed that the fall of classic civilisation was due to the failure to develop women. But women never could have been brought into line with classic civilisation without transforming it entirely. As a matter of fact, when the feminine element at last came to the front in the later Empire with Christianity and the barbarians, classic civilisation went. The broader and more varied character of modern civilisation seems to render more possible than did the narrow basis of classic civilisation, the development in equal freedom of both the masculine and feminine elements in life. Still there is considerable advance yet to be made. So long as maternity under certain conditions is practically counted as a criminal act, it cannot be said that the feminine element in life has yet been restored to due honour.[1]

It will be seen that a broad and general survey of the secondary and tertiary sexual phenomena in humanity brings us at last into a humble and conservative attitude before the facts of the natural world. It could scarcely be otherwise; the sexual adjustment has been proceeding for so vast a period of time, even if we only take Man and his immediate ancestors into consideration, that the sexual balance has become as nearly perfect as possible, and every inaptitude is accompanied by some compensatory aptitude, even if it has not, as sometimes occurs, itself developed into an advantageous character. An open-eyed, childlike,

[1] This state of things is, however, beginning to pass away. Thus in Russia there are no longer any 'illegitimate' children. Every child, whether or not its parents are married, must have a recognisable father and mother and is duly provided for; there is therefore no social offence in producing it, and though abortion is legal it is not usually approved.

yet patient study of the natural facts of life can only lead us to be reverent in the face of those facts.

This conclusion must not, however, be misunderstood. A cosmic conservatism does not necessarily involve a social conservatism. The wisdom of Man, working through a few centuries or in one corner of the earth, by no means necessarily corresponds to the wisdom of Nature, and may be in flat opposition to it. This is especially the case when the wisdom of Man merely means, as sometimes happens, the experience of our ancestors gained under other conditions, or merely the opinions of one class or one sex. Taking a broad view of the matter, it seems difficult to avoid the conclusion that it is safer to trust to the conservatism of Nature than to the conservatism of Man. We are not at liberty to introduce any artificial sexual barrier into social concerns. The respective fitness of men and of women for any kind of work or any kind of privilege can only be ascertained by actual open experiment; and as the conditions for such experiment are never twice the same, it can never be positively affirmed that anything has been settled once and for all. When such experiment is successful, so much the better for the race; when it is unsuccessful, the minority who have broken natural law alone suffer. An exaggerated anxiety lest natural law be overthrown is misplaced. In recent years the spectacle of the New Russia has been a test of our sound judgment at this point. The world is not so insecurely poised. We may preserve an attitude of entire equanimity in the face of social readjustment. Such readjustment is either the outcome of wholesome natural instinct, in which case the social structure will be strengthened and broadened, or it is not; and if not, it is unlikely to become organically ingrained in the species.

Our investigation, therefore, shows us in what state of mind we ought to approach the whole problem; it can scarcely be said that it gives us the definite solution of definite problems. It is not on that account fruitless. There is distinct advantage in clearing away, so far as we

can, the thick undergrowth of prepossession and superstition which flourishes in the region we have traversed to a greater extent than in any other region. It is something to have asked the right question, and to be set on the right road. It is something, also, to realise that we may disregard the assertions, or even the facts, of those who have not faced all the difficulties that must be encountered. At the very least it seems impossible to follow the paths we have here traversed without gaining a more vivid and tolerant insight into what for us must always be the two most interesting beings in the world.

THE END

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